AN INVESTIGATION OF PROFIT RATES IN DEFENSE CONTRACTING

NASA Economic Research Project
The George Washington University

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An Investigation of Profit Rates in Defense Contracting

This is a second report of the NASA Economic Research Project of the George Washington University, Dean Arthur E. Burns, Director.

The research effort of this project has been oriented towards topics of interest to procurement officials. The principal report, published in December, 1965, was a study of incentive contracting and contractor decision making. Both studies were supported by NASA Grant NsG 425.

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Introduction

It is unlikely that the fundamental question of government procurement will ever be satisfactorily answered -- are the profits resulting from government procurement actions inadequate, sufficient, or excessive? The answer demands the existence of an acceptable index and scale; neither economic theory nor ethics provides such a basis for evaluating profits. However, capital in the aerospace industry is acquired in competitive capital markets and can be put to alternative uses; procurement agencies are obliged to pay rates which will cover the costs of obtaining that capital.

There is a frequent assertion that the profit standards for the government should be those levels which will "attract capital to the industry." This is a rather ambiguous phrase; in general, it refers to profit opportunities which would warrant the manager's investment of capital. If a firm's earnings stream was completely certain, and assuming a competitive market for capital, the management could properly accept investments with rates of return greater than or equal to the interest rate; i.e., profit opportunities with such yields would "attract" capital. Earnings, however, are uncertain, and there is a comparable (and higher) return demanded of risk or equity capital. Under conditions of profit uncertainty, the above profit standard would be achieved if the expected profit return exceeds the rate of return which suppliers of risk capital demand. This rate will vary from firm to firm and between industries according to the uncertainty which the suppliers of capital attach to the earnings stream. This rate is the cost of equity capital. Although firms may obtain and use capital for investments yielding lower

rates than the cost of capital, the net result of such actions are not in the best interests of the stockholders.

A measure of the cost of equity capital provides a lower limit for the required profit rate - a marginal rate. This rate is not necessarily a goal, but a boundary.[1] Although the capital cost determines "how much is just enough," there is no measure to determine "how much is too much." The problem of evaluating profit outcomes is somewhat analogous to measuring utility. Total utility is unmeasurable; rates of substitution, however, are theoretically measurable. The determination of unconscionable profits is similarly beyond attainment, but the cost of capital should be capable of resolution. For those who are required to make evaluations and judgment of profit outcomes, the cost of capital provides, at lease, one definitive point.

Part I is an examination of the cost of capital in selected industry-groups, particularly groups of firms primarily involved with government contracting. Part I is divided into two portions: Ia presents selected time-series data and the customary ratio analysis for specific industry-groups selected; Ib evaluates over all profit outcomes in terms of a general, or average, measure of the cost of capital for the industry-groups developed in Ia. The procedure is exploratory and makes adaptations of models which capital theorists offer as descriptive of market behavior and normative for managerial decisions.

Part II of the paper was prepared by Professor Huntley, and utilizes a

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[1] In practicality, there are often circumstances in which the manager may not wish to accept investments with yields as low as the cost of capital, even assuming the latter is satisfactorily measured.

procedure proposed by Jacoby and Weston (11) as a test of the reasonableness of profits for Renegotiation Board objectives. Part II is presented as an independent study of industry profits performance with separate conclusions.

Part III is a summary description of the various profit theories of economics. Such a discussion is apropos to the subject of this paper; it is also responsive to an interest exhibited by certain procurement personnel during our discussions.

Part I

Comparative Profit Experiences and Cost of Equity Capital

Part Ia

Return on Equity for Selected Industry Groupings, 1954-1965

Other Studies

Government procurement policies and procedures are scrutinized by government agencies, politicans, and industry groups. A focal point for much of this interest is the profit outcome on government contracts. The attention this subject of profitability receives underscores the importance and difficulty of the questions involved. A review of several studies concerning aerospace-defense industry profits is an appropriate point of departure for the analysis of this topic in the present study.

One significant study on the defense industry was prepared by Arthur D. Little, Inc. (2). Included in this study were sections on the defense market, the legal aspects of defense contracting, and prognostications about the changing patterns in these areas, but the bulk of the analysis was centered on the financial structure and performance of the industry. The data used were from published compilations by the Renegotiation Board, and, principally, the Aerospace Industries Association publication Aerospace Facts and Figures, 1962. Small amounts of additional data were collected by the research staff in order to obtain sample estimates of certain structural relationships within the industry.

The analysis of profitability in the defense industry is transformed from a traditional presentation to one which is enigmatic. It is stated that the adequacy

of profits is the essential question facing DOD and industry, but the nature of the problem is such as to make a definitive answer unattainable. Their method of analysis is developed from the view that the question of an adequate return is of a deeper nature than can be resolved in terms of return on sales or return on equity. It is possible (and necessary) they say, to measure some of the implicit costs which profit must cover, the most important of these being the cost of capital - defined as the return which must be provided to secure capital from investors. For derivation of this cost of capital by their method, it is necessary to compare the profit to the total investment required to earn the profit.

> . . . the objective of (this) analysis should be to compare the return generated by the assets employed in defense production with the investment required to make the products. (2: p. 58)

Due to the vagaries of accounting data - especially in the aerospace industry - adjustments are made on the balance sheet assets in order to approximate the total of all assets at the disposal of the industry. The total investment required to complete production in the defense industry is total balance sheet assets adjusted to include rental capital, progress payments, loan securements, advances, and government furnished capital. Industry earnings are concurrently adjusted to reflect the imputed revenue arising from the adjustments on the asset base. From the resulting asset base and the assumption that the industry debt-equity relationship prior to adjustments in the asset base is maintained, adjusted equity figures emerge to which the adjusted earnings are compared. These adjustments to the equity base have a significant affect on the resulting computations of return on equity and cost of capital, the calculation of which is weighted by the adjusted debt and equity figures.

The principal findings and conclusions of this study, briefly, are:

(a) Return on sales and return on equity (adjusted) are low relative to all U.S. manufacturing ... over the longterm if this continues capital will be drawn away from the industry.

(b) Analysis of cost of capital indicates that the aerospace sector is still sufficiently profitable to attract the needed capital.

(c) Capital flight has not been observed because the industry is relatively immune to cyclical variations, and financial risk, on a given contract, is low due to the flexibility in contract forms.

(d) The defense industry will require more capital. Increased use of debt financing must occur if the return on equity is to be maintained at an acceptable level, but this will increase the financial risk to the industry through heavy fixed responsibilities. Alternatively, extensive equity financing will result in even lower returns.

Large commercial aircraft development cost write-offs in the terminal years of this study resulted in a significant downward bias in return on sales and return on equity. Return on equity in the aerospace industry is lowered even further due to the above mentioned manipulations on the equity base. These adjustments also obscure the cost of capital calculations. But if a static cost of capital is computed, and analysis of it indicates that the industry is sufficiently profitable, withdrawal of investment funds (capital flight in (c) above) is not to be expected. Even if the level of earnings were "insufficient", it is not apparent

what meaning is to be attached to the term "capital flight", or how this phenomena would be characterized by financial data. As for the dilemma presented in (d), the method of financing additional capital is not strictly a polar situation. It is well known that the defense industry makes extensive use of extraequity capital, and this pattern is not expected to change radically in the near future; thus, the fears expressed in this conclusion appear exaggerated.

Another major study on the aerospace industry was presented by the Stanford Research Institute (26). Contained in this omnifarious report, prepared for the Aerospace Industries Association, is an exhaustive financial analysis of the aerospace industry. A myriad of financial ratios is employed to discuss the profitability and structure of the industry.

> This study focuses its analysis on the rate of return on total assets, because this rate provides a more comprehensive measure of performance and a better basis for comparing the results of businesses with dissimilar financial structures. The return earned by a company on total assets is a measure of the profitability of an enterprise as an economic entity. This single figure indicates the effectiveness - from a profit standpoint - with which all of a firm's economic resources are employed. (26: II - 94)

The ratios compare selected groups of aerospace firms with a "cross-section" of 104 U.S. manufacturing firms, exclusive of the aerospace industry, over adjacent five year segments from 1947 through 1961. There are no conclusions in the financial section of the Stanford Research Institute paper, only observations: profit margins on sales of the aerospace group have been declining and significantly below the "cross-section" margins; the industry has entered into a period of relatively high and stable sales volume; the aerospace industry is more heavily leveraged than the "cross-section," and earnings of aerospace firms appear to

have been sufficient to attract capital into the industry.

A later study, by Thomas G. Miller of Arthur D. Little, Inc. (17), concludes that the aerospace market is no longer a growth market, that aerospace firms cannot expect to grow throughout the decade, and thus should strive for stability - especially since "the industry itself suffers from profit margins too low to justify the large-scale and long-term support of speculative ventures." (17, p. 6) Recent intensifications of the Southeast Asia situation have accelerated production in the aerospace industry, and most likely have changed the base on which the growth projections in this study were made. It appears that the recommendation that the aerospace firms should strive for stability relies heavily on an analysis of the profit margin on sales - a statistic which must be analysed in conjunction with a turnover rate in order to have relevance to profitability. Evidence of any such combined analysis is missing in this study.

The Present Study

There are no absolute measures for judging profit outcomes, and any investigation of profit performance must develop its perspective in the traditional manner of inter-industry comparisons. Preferrably, the comparative analysis would examine profit returns on government and non-government sales by industry groups. There are, however, no published data with this break-down. The alternative is to examine and compare financial data of firms with a high percentage of government sales with those with a correspondingly small proportion of sales to the government. This would provide some understanding of profit performance as it relates to government contracting, although the results are still contaminated by nongovernment sales experience.

TABLE 2

PRICING GOALS OF TWENTY LARGE INDUSTRIAL CORPORATIONS

(1)	(2)	(3)		(4)	
Company	Principal Pricing Goal	Rate of return on Investment (after taxes) 1947-1955		1956-1963[a]	
		Avg.	Range	Avg.	Range
Alcoa	20% on investment (before taxes); higher on new products	13.8	7.8-18.7	7.95	4.5-16.5
American Can	Maintenance of market share	11.6	9.6-18.8	9.0	7.5-28.3
du Pont	Target return on investment - no specific	25.9	19.6-34.1	24.6	22.1-28.3
Esso (Standard Oil of N.J.)	"Fair return" target - no specific figure given	16.0	12.0-18.9	12.0	9.4-16.6
General Electric	20% on investment (after taxes); 7% on sales (after taxes)	21.4	18.4-26.6	17.7	13.7-21.1
General Foods	33-1/2% gross margin: ("1/3 to make, 1/3 to sell, and 1/3 for profit"); expectation of realizing target only on new products	12.2	8.9-15.7	na	
General Motors	20% on investment (after taxes)	26.0	19.9-27.0	17.7	12.6-23.0
Goodyear	"Meeting competitors"	13.3	9.2-16.1	12.2	10.1-14.0
Gulf	Follow price of most important marketer in each area	12.6	10.7-16.7	12.7	10.7-16.0
International Harvestor	10% on investment (after taxes	8.9	4.9-11.9	na	
Johns-Manville	Return on investment greater than last 15-year average (about 15% after taxes); higher target for new products	14.9	10.7-19.6	10.1	8.4-13.4
Kennecott	Stabilization of prices	16.0	9.3-20.9	na	

Kroger	Maintaining market share	12.1	9.7-16.1		na
National Steel	Matching the market - price following	12.1	7.0-17.4		na
Sears Roebuck	Increasing market share (8-10% regarded as satisfactory share)	5.4	1.6-10.7		na
Standard Oil (Indiana)	Maintain market share	10.4	7.9-14.4		na
Swift	Maintenance of market share in livestock buying and meat packing	6.9	3.9-11.1		na
Union Carbide	Target return on investment	19.2	13.5-24.3	16.2	14.2-19.2
U.S. Steel	8% on investment (after taxes)	10.3	7.6-14.8	8.8	4.9-14.3

Source: /16, pp. 924-6/

(a) Rates of Return for Identical Companies in Selected Manufacturer Industries, 1954-63. Federal Trade Commission.

The selection of firms with a preponderance of government sales presents its own problems. For example, one might select all firms with 95% of the sales with the federal government as being a reasonable lower bound for inclusion in this group. This approach is not practical on two counts: first, the number of companies with this percentage (or higher) of sales with the government is extremely small (and changing over time); second, such a basis would exclude most of the major defense contractors. This circumstance has forced a broader limit to the classification for this study; firms classified as "capitve" have 75% or greater government sales and were continually included in the DOD and NASA "Top 100" lists.

The other extreme of the industry grouping - those firms with little or no government sales - represents a more difficult problem of selection. There are many industries and firms with little or no sales to the federal government, including such industries as the cosmetics, construction, etc., prima facie irrelevant for the purposes of examination. The rationale used herein is to select the firms with small percentages of government sales from the lists of top defense contractors. Midpoint in the time period there were 18 firms with 25% or less of their sales to the federal government among the "Top 100" (ranked in terms of government sales). These were selected as the "control group." This basis of selection restricts the non-government grouping to large firms - it is a large company that can be classified in the "Top 100" with less than 25% of its sales to the federal government. On the other hand, it defines a group of firms that are technologically oriented, with considerable budgets for R&D, in competition for scarce engineering and technical personnel and conducting large scale manufacturing and assembling operations.

Within each of the two major groups of firms being compared a further break-down is made. The firms heavily dependent on government sales are divided into three overlapping subgroups: those companies which are and have been considered the larger prime aerospace contractors, those aerospace forms which are completely dependent on the government for their existence (greater than 90% of total sales renegotiable), and those firms with greater than 75% of total sales renegotiable but not included in the first group (primarily electronics firms and smaller aerospace firms). The first subgroup is labeled group A; the second, group B; and the third, group C.

The firms selected for comparison with these "capitve" companies conceivably have more flexibility in their pricing policies and operating methods, i.e., are subject to only minimal overt governmental control. These are divided into three broad subgroups by industry type: group D.1, rubber and tire manufacture; group D.2, chemical processing and manufacture; and D.3, automotive products.

The following is a listing of the firms in each captive[2] and noncaptive subgroups.

2 There are several defense contractors not included in the group of captive companies for one reason or another. The principal barrier to such firms was the restriction imposed by the definition "captive," i.e., greater than 75% renegotiable sales. A second major barrier was the inaccessibility of data, including complications of major mergers in the period under analysis. Three noncaptive firms were eliminated from our analysis since they could not be formulated into another meaningful subgroup.

Group A	Group B	Group C
The Boeing Company	N. American Aviation	Kaman Aircraft
General Dynamics	Northrop Corp.	Marquardt Corp.
Douglas Aircraft	Grumman Aircraft	Ryan Aeronautical
N. American Aviation	Republic Aviation	Thiokol Chemical
Lockheed Aircraft	McDonnell Aircraft	American Bosch Arma
United Aircraft	Kaman Aircraft	Avco Corp.
Republic Aviation	Marquardt Corp.	Fairchild Hiller
McDonnell Aircraft	Ryan Aeronautical	General Precision
Grumman Aircraft	Thiokol Chemical	Hazeltine Corp.
Northrop Corp.		Hoffman Electronics
		Raytheon Company
		Sanders Associates

Group D.1	Group D.2	Group D.3
Firestone Tire	E.I. duPont	General Motors
U.S. Rubber	Union Carbide	Ford Motor Company
B.F. Goodrich	Olin Mathieson	Chrysler Corp.
Goodyear Tire	Eastman Kodak	Borg-Warner
		Rockwell Standard
		White Motor Company
		International Harvestor

The data analysed herein are exclusively from published sources.[3] The time period of our analysis (1954-1965) is sufficiently homogeneous for the analysis presented in this study since it covers the period after the transition of the aerospace industry into a more permanent "peace-time" industry - a continual supplier of weapons and space systems. There have been changes during this period; for example, there is now less emphasis on the procurement of heavy strategic weapon systems and more emphasis on R&D and capability development. The advent of NASA into the procurement picture and the shift of procurement emphasis to limited-war weapons were important factors affecting individual firms within the industry, but these factors have not specifically resulted in significant changes in the sales or profit patterns of the industry as a whole. The Viet Nam buildup represents

3 The data was compiled from S.E.C. Form 10-K and annual reports filed with the securities and Exchange Commission. Supplemental data was obtained from Moody's Industrial Manuals, 1954-1965.

an upward fluctuation of sales and production from the trend of the past decade, and the consequent future developments in aerospace sales are speculative.

In any sort of comparative financial analysis a measure of performance must be established. In the Stanford Research Institute study (26), return on net balance sheet assets was chosen. Great pains were taken in that study to specify the different structural relationships existing between the aerospace group and their "cross-section", e.g., differences involving progress payments, advance payments, rental capital, and government furnished capital, which distort the financial ratios (including return on balance sheet assets) for comparative purposes. In the Arthur D. Little study (2) an attempt was made to adjust, estimate, and revise aggregations of defense firms' balance sheets and income statements to account for the different methods of accounting for depreciation, inventories, and advances, and also account for those forms of financial and material capital which do not show up on the balance sheet.

In both of these studies, but particularly (2), the object of the analysis was to reflect the "true" total investment of the industry and the revenue generated by this total investment. This approach, however, is not directly applicable to questions of profit levels and rate of return in the defense industry. Such an analysis may possibly be useful for comparing non-homogeneous groups of firms with respect to operating efficiency, but not relative profitability.

An analysis of profitability must be directed by a realization of what constitutes profits and to whom they accrue. Profits are paid to holders of equity - not owners of debt capital. This obviosity would be unwarranted, except for the fact that it has almost been ignored in other studies. Return on total

balance sheet assets is emphasized in the Stanford Research Institute paper (26), and in the Arthur D. Little report (2); the manipulations made were supposed to enable analysis of the adjusted earnings in terms of an equity base which would result if the aerospace industry were compelled to conform its capital structure to the average of U.S. manufacturing. However, analysis of this nature seems to beg the question. The financial structure of the aerospace industry has evolved over the course of many years. Politically speaking, it would seem more desirable to maintain the low margins and high turnovers in this industry than the contrary; this result can be achieved (and is) through the present government policies.

To state grounds for comparison along the lines in (2), and to a lesser extent (26), is to lose sight of the subject and industry being studied. An analysis focusing on return on equity investment and the components of this ratio is not only conceptually more simple than the analyses in the above studies, but provides the only appropriate insight into the question of relative profitability.

The principal financial variables utilized in this analysis are:

Net Worth	Owner's equity portion of the balance sheet, less preferred stock[4] and treasury stock (symbol NW).
Profit	Net income (net of interest) less preferred dividends before corporate income taxes (symbol Pbt) or after corporate income taxes (symbol Pat).
Sales	Net sales, and other operating income when only available in combined form (symbol S).

4 Preferred stock is considered a form of debt in our analysis since the dividend for this form of security is generally fixed in amount and, at least tacitly, in regularity; thus, it is essentially equivalent to a debenture.

Total Assets	Total balance sheet assets, net of accumulated depreciation, progress payments and advances (symbol TA).

In this part of the study return on equity is analysed via the static ratio Pat/NW. Fluctuations and trends in this ratio over time can be examined in terms of changes in profits, the equity base, or both. In addition, institutional and policy affected relationships, e.g., financial structure, profit margin, utilization or turnover rates, etc., can be analysed as component parts of the return on equity ratio. A comparison of each of the groups selected is made in terms of these ratios.

As stated above, the effect of procurement policy on the return on the investment of the stockholder is our main interest; this return is expressed in the ratio Pat/NW. Profit margin on sales, Pbt/S, is examined using pre-tax profits in order to avoid the complications arising from loss carryovers. The ratio of profit to sales is most closely scrutinized by all parties involved or interested in procurement matters. This close attention is only partially justified since the profit margin is but a partial indication of profitability. This statistic must be combined with measures of structural and financial leverage in order to determine its revelance to return on equity. An important measure of structural leverage in this regard is the turnover rate, S/TA, and the measure of financial leverage used in this part of the study is equity assets as a proportion of total assets, NW/TA.

Decomposition of return on equity into the above three ratios enables consideration of the different methods of operation between industry groups. Variations in the rate of return over time can be reduced to fluctuations in one or more of the component parts of the ratio.

Aggregate time-series for each captive and noncaptive group are presented in Figures 1 - 6. Ratios of these aggregate data are presented in Figures 7 - 10, e.g., Pat/NW for group A in year t is calculated $\overline{/\sum_{A}(\text{Pat})_i/} \;/\; \overline{/\sum_{A}(\text{NW})_i/}$, where i represents the firms in group A. For each captive subgroup, time-series scatter charts were plotted on each of the four principal ratios, Pat/NW, NW/TA, Pbt/S, S/TA, analysed in this part of the study, and the median values for each of these ratios are presented in Figures 11-14, respectively.

Summary of the Data

Return on equity declined for all captive and noncaptive subgroups over the period 1954 to 1960-61. This time period corresponds to the latter part of the period analysed in (2) and (26). As mentioned previously, much of the precipitous decline in earnings of group A in the years 1958-61 was due to rapid write-offs of commercial aircraft developmental costs.[5] The decline in the rate of return over this period was much more severe in the aerospace firms (groups A and B) than for any of the noncaptive groups. (See Figures 7, 11, and Table 1 below). Since 1961 the rate of return on equity has been rising for groups A, D.2, and D.3, and stable for groups B, C, and D.1. At the end of our time period return on equity for groups A and B is in the 14% - 17% range compared with 25% in 1954; for group C, the beginning and ending rates are approximately equal at 10%. For noncaptive groups D.2 and D.3, the initial and terminal rates are approximately 20%,

5 The effect of these commercial write-offs on the rate of return for group A somewhat distorts the analysis of the impact of procurement policy on profitability in this group. These distortions should be eliminated from the analysis, but it is not possible to separate results of government business from those on non-government business within the confines of published data.

while the rate of return on equity in D.1 declined from 15% to 11% over the period examined.

One of the factors accounting for the rapid decline in the rate of return on equity for groups A and B during the first half of our time period was the accelerated growth rate of net worth in those groups. Growth of profits did not keep pace with growth of net worth over this period. Growth rates of earnings and net worth were not significantly different for the other groups or in the later time period; consequently, changes in rates of return were not as drastic.

Analysis of changes in financial structure (Figure 8) reveals that this rapid growth of net worth in group A was concurrent with as rapid a growth rate of total assets, whereas in group B net worth increased faster than other balance sheet items during this early period.[6] For group C net worth was a relatively constant proportion of total assets from 1954-60, and has been an increasing proportion thereafter. Over the whole period net worth increased as a proportion of total assets in all groups except D.2 and D.3. The captive firms have made considerably more use of this financial leverage than have the noncaptive firms, although there has been a narrowing of the gap over time.

Changes in the structural leverage, turnover on sales, should be considered in conjunction with the measure of financial leverage. The affects of leverage on the return on equity can be examined by considering these two ratios together. Turnover rates are traditionally higher in the aerospace industry than in any of the groups chosen for comparison (see Figures 10 and 14). This may be due in part to the nature

6 In Figure 12, however, all the captive subgroups maintained about the same financial structure from 1954 to 1959-60; at that point the financial leverage in each group was reduced, and a new level was established for the remainder of the period.

of the products in the various industries, but the difference is principally a result of the methods of operation which have evolved in the aerospace industry. Turnover rates are higher in the aerospace industry because of the items specifically excluded from total assets in this industry. Examples of these items range from the various forms of fixed assets, e.g., government furnished buildings and equipment and extensive use of rental capital, to financial support in the form of progress payments and loan securements.

Turnover rates were fairly constant for all captive and noncaptive subgroups through the middle of the observed time period. A slight downtrend in this rate was experienced by groups A, B, and D.3 at the beginning of the period, but these same groups experienced increases in this rate in the latter portion of the time period. Group C (electronics and small aerospace firms) appears not to enjoy the same level of direct support, reflected by the turnover rates, as do the larger aerospace firms. The differential between turnover rates, from noncaptive group D.2, at 1.0, to captive groups A and B, at almost 3.0, is relatively greater than the difference in the financial leverage, with net worth representing 70% of total assets in D.2, as compared to 40-50% in groups A and B. The combined effect of both forms of leverage results in sales to net worth ratios of approximately 6.0) in the aerospace industry, but only 1.5 to 2.5 in the noncaptive groups. Consequently, a margin on sales in the aerospace groups considerably below that in the noncaptive groups can, due to the greater leverage experienced by the former groups, result in an equivalent or greater return on equity.

Much attention is given to the rate of profit on sales. Captive groups have experienced only a modest decline in profit margins over the time period analysed,

i.e., a decline from approximately 7% in 1954 to about 5% in 1965. (See Figures 9 and 13). And, smoothing the dip due to commercial write offs in the middle of the period, the decline has been very gradual. The margin experience in the three noncaptive subgroups is varied, but a slight downtrend in margins over time is also apparent.

The attention given to the rate of profit on sales is warranted if due consideration is also given to leverage factors, since profits margins are related to return figures only through the leverage factor. Profit margin levels of captive and noncaptive groups are very different. The margins in the captive groups are low relative to groups D.2 and D.3, but the leverage factors in these latter groups are very low relative to the aerospace groups, with the net result (return on equity) being comparable among all of these groups.

An Alternative Calculation of Return on Equity

The emphasis in this discussion of relative profitability centers on return on equity. The analysis in this study focuses on the static ratio of profits after taxes to net worth presented in the form Pat/NW in Figures 7 and 11. This calculation is adequate for the general presentation intended here. In Table 1 below, the rate of return on equity is calculated slightly differently. The equity base on which the profits are earned is constantly changing with each financial transaction, and, given a steady growth in this equity, year-end figures for this base lend a slight downward bias to the return ratio. Also, the profit being compared to the base is included in the base. The following adjustment are made to the equity base used in computing the rate of return on equity.

$$\text{adj NW}(t) = .5\left[\overline{\text{NW}(t) - \text{Pat}(t) - \text{Div}(t) - \text{NW}(t-1)}\right]$$

This adjusted equity represents an average of the base on which the annual profits were earned. Net Income after taxes, less preferred dividends, are divided by the adjusted equity figures and the resulting returns are presented in Table 1. The return rates in Table 2 are within the range of profit objectives determined in the Lanzillotti study [16, pp. 924-6] which immediately follows this table.

Table 2

Return on Equity Capital in Captive and Noncaptive Groups (1954 - 1961)

year	A	B	C	D.1	D.2	D.3
1954	30.92%	31.14%	12.76%	15.06%	21.34%	22.68%
1955	27.24	37.92	9.57	17.13	23.27	28.94
1956	22.99	20.20	0.01	15.33	19.62	16.17
1957	22.32	19.94	14.24	13.79	17.83	15.87
1958	15.09	15.71	6.04	11.43	14.56	8.80
1959	7.37	16.80	14.19	12.87	17.39	16.37
1960	7.49	13.53	7.36	10.93	15.70	15.36
1961	(0.95)	14.69	10.48	10.64	15.21	13.03
1962	16.59	14.21	12.10	9.36	16.57	18.95
1963	14.91	13.95	8.96	9.18	17.71	19.48
1964	15.22	13.68	9.66	11.05	20.03	19.96
1965	18.53	16.61	11.10	11.22	19.54	22.64

Profit Objectives of Large Corporations

Our dependence upon a comparative inter-industry examination was previously explained; it is useful to examine the declared profit objectives of the managers of large corporations. If constant pursuit and examination of the proper use of stockholders' capital has any reward, the avowed goals of the managerial group should provide a useful basis for evaluating profit performance.

One of the few papers providing information on corporate profit objectives

was prepared by Lanzillotti /16/. His study was the result of a lengthy investigation into the pricing objectives of various large corporations - companies generally large enough to be price leaders or at lease "masters of their fates"; hence, they are able to adjust pricing to the company's general goal.

Lanzillotti found that although a firm may have many pricing objectives (and the companies which he investigated were not exceptional in this regard), pricing to achieve a target return on investment was by far the most frequently mentioned of the pricing goals. About 50% of the firms with this pricing objective indicated that they were attempting to achieve a particular rate of return on investment in either the short-run or long-run or both.

Table 2 is taken from the Lanzillotti paper /16;pp.924-6/, except for column 4, which has been added. This table presents in summary form the profit objectives of the firms examined and their actual performance as measured by return on equity capital. The average target return mentioned was 14% after taxes; several firms stated that their goals were 20% after taxes. The exceptionally low profit objective for U.S. Steel apparently evolved from the company's continual position of political scapegoat; a low profit goal was selected with a primary emphasis on its public image.[7] Based upon the average return on the years 1947-55, most of the firms exceeded their target goals. However, this was a period of relatively high business prosperity. Column 4 indicates that several firms (for which data were compiled by the FTC) show average returns in the past decade below the target goals.

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7 Data in Column 4 indicates the degree to which U.S. Steel has attained its target goal in the last decade. The firm's recent efforts to increase profits does not suggest that a modest profit goal has improved the firm's position as a political dart board.

This is a significant study for our purposes. For one thing, it is a clear statement of pricing objectives, based upon standard volumes and standard costs. Further, they represent long-run objectives - objectives which the managers have determined as practicable and desirable when combining all of the firm's objectives, such as sales maximization, public image, etc. But they also represent a collective managerial opinion of what is a "fair profit" (a statement that was frequently made in defense of a particular profit goal). A manager's appraisal of fairness is not necessarily an adequate measure of an ethical concept - if such a measure is at all pertinent. But it is another manifestation of what constitutes "adequate" returns which, if not determined by a free market, are at least highly conditioned by one.[8] While these profit objectives are not necessarily those which should be adopted by government contractors (note that no primary government contractor is represented in Table 2), they do provide a certain basis for judgment of profit goals and achievements of any large corporation. The data are, however, somewhat dated; they illustrate profit objectives of apparently 10 years ago. The subsequent period, 1954 to date, has been characterized by intense competition and a general lowering of margins and rates of return for most industries. It is certainly unlikely that the profit goals would be significantly greater than those expressed in Table 2.

One point should be noted in examining the data in Table 2. Capital-manage-

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8 Joel Dean cites 4 criteria for determining what "reasonable" profits should be /5; p. 34/: (1) what it takes to attract outside capital, (2) earnings needed to finance the firm's development solely from retained profits (plus depreciation); (3) what comparable firms have normally earned; (4) what the man in the street thinks is a reasonable profit. Therefore, the words "fair profit" encompass a number of considerations and judgments improperly described by the ill-chosen adjective "fair."

ment procedures and objectives are by no means uniform; however, most investment decisions are formulated on the total amount of capital involved - both equity and debt capital. Therefore, the profit objectives as stated in Column 2 are assumed to be rates based on total capital employed. Columns 3 and 4, however, are based upon return to equity capital only. Therefore, a firm with some leverage would typically make more on equity than the target goals. Furthermore, the target goals involve future expectations while the return on capital involves past experience. In this regard, Column 2 provides data more appropriate to the analysis following in section 2 than do Columns 3 and 4.

Table 2. -- Ratio of Calculated Earnings to Actual Earnings for Individual Companies Composing the Group of NASA Contractors and the Aggregate of Standard Companies, Ten-year Periods terminating in 1953, 1958, and 1963

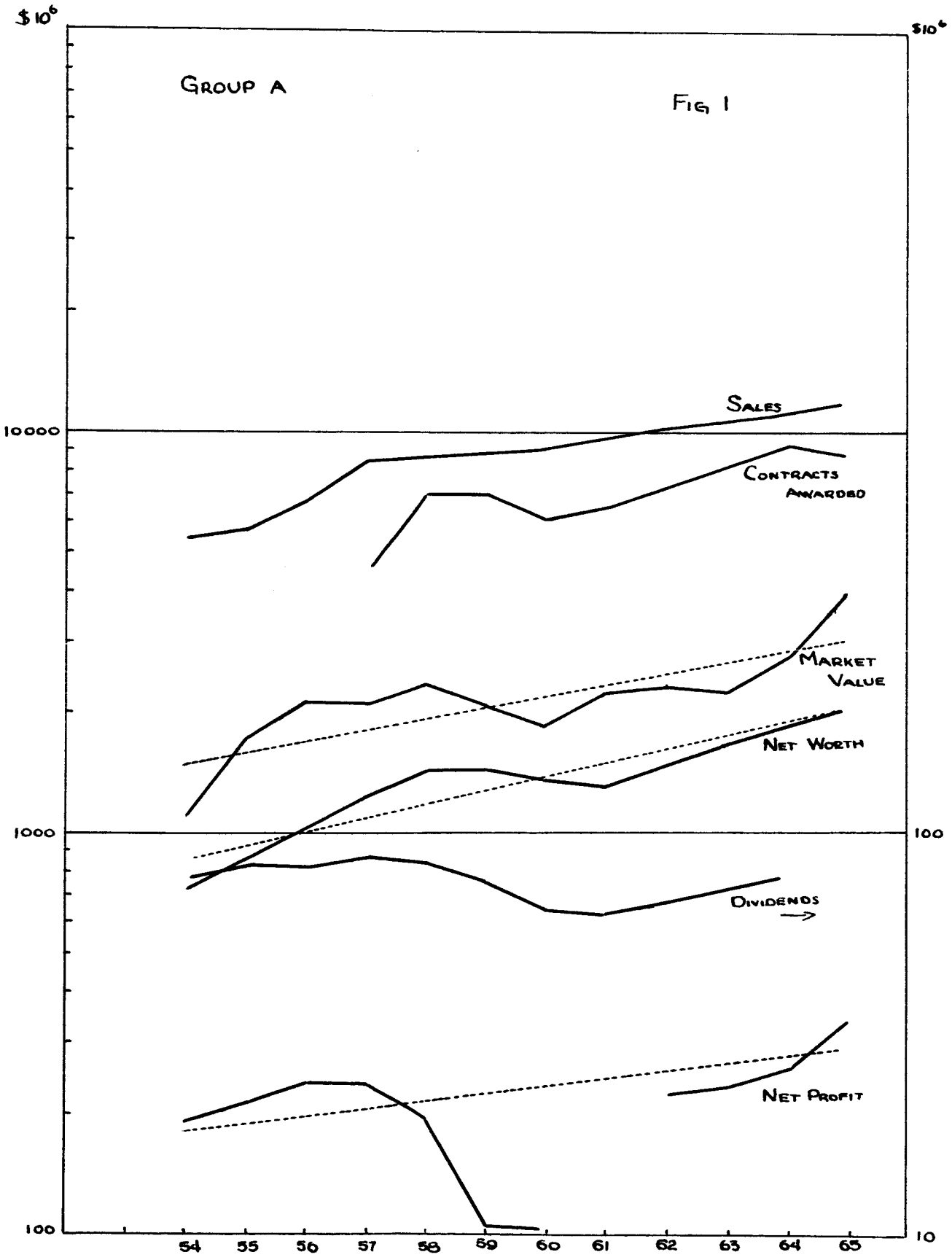
Company (Industry group)	C/A Ratio[1] 1963	1958	1953
NASA Contractors:			
Boeing (Aerospace)[2]	1.36	1.61	0.99
United (Aerospace)[3]	1.24	0.99	1.40
North American (Aerospace)	0.71	1.02	0.99
General Dynamics (Aerospace)	0.35	0.99	0.98
Lockheed (Aerospace)[3]	0.43	1.39	1.09
Douglas (Aerospace)[3]	0.74	1.80	0.99
McDonnell (Aerospace)	0.71	1.46	1.88
Northrup (Aerospace)	2.33	1.35	0.34
Republic (Aerospace)	3.60	3.26	0.66
Grumman (Aerospace)	0.83	2.58	0.70
Standard Companies:			
General Motors Corporation (Automobile)[2]	0.38	1.26	0.41
Ford Motor Company (Automobile)	0.99	2.32	a
E.I. du Pont (Chemical)	0.23	0.44	0.25
Union Carbide (Chemical)	0.43	0.55	0.32
Chrysler Motors (Automobile)	0.52	b	0.64
Firestone (Rubber)[2]	0.86	1.59	0.95
Goodrich (Rubber)	1.22	1.46	0.98
Olin-Mathieson (Chemical)	0.85	3.55	0.51
United States Rubber (Rubber)	2.28	3.29	1.19
Borg-Warner (Automobile)	0.98	2.28	0.65
Libby-Owen-Ford (Stone, clay, glass)[2]	0.51	0.97	0.71
Corning (Stone, clay, glass)	0.20	0.46	0.48
Anchor-Hocking (Stone, clay, glass)	1.12	1.26	1.46

1. See table 1, footnote 2
2. Companies ranked within NASA group and within Standard group by size of equity capital claims in 1963. Companies specifically designated by this footnote are largest companies in their own industrial groupsings.
3. These companies typically experience between sixty and eighty-nine per cent of their revenue deriving from the Federal Government; all other NASA contractors on this list experience more than ninety per cent of their revenues from government sources. See: Standford Research Institute, The Industry-Government Aerospace Relationship, Vol II, pp. 90-91.

a. Could not be calculated since Ford Motors was not an open corporation until 1954. Similarly, the 1958 C/A ratio is not based on ten-year yield and payout data as is so for other companies.

b. Could not be calculated meaningfully since Chrysler had a loss in 1958 -- a negative value for A would obtain.

Source: Securities and Exchange Commission, Standard and Poor, and Moody: see source of table 1.


$10^6
$10^6
GROUP A
FIG 1
SALES
10000
CONTRACTS AWARDED
MARKET VALUE
NET WORTH
1000
100
DIVIDENDS
NET PROFIT
100
10
54
55
56
57
58
59
60
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62
63
64
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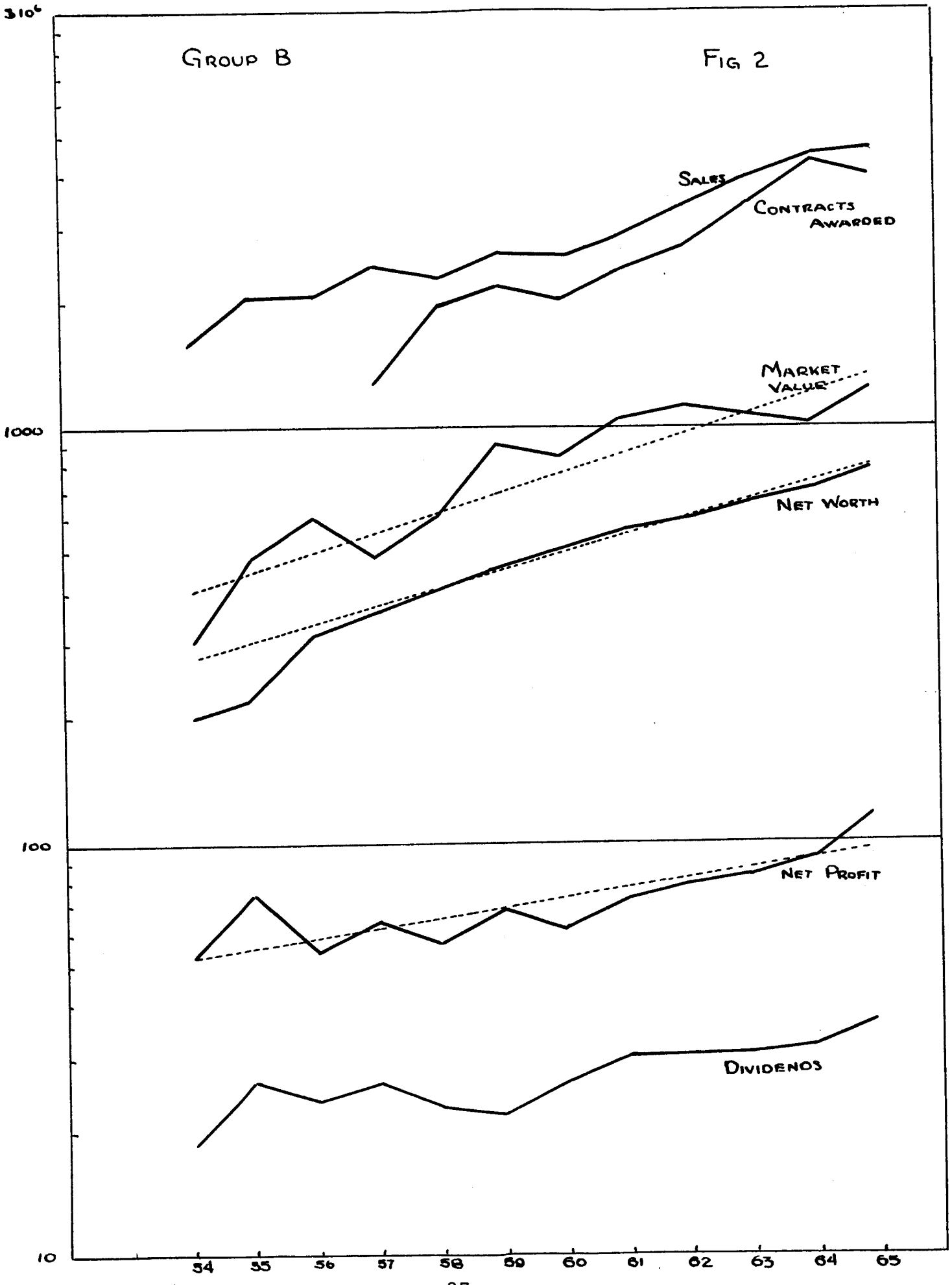
10^6
GROUP B
FIG 2
SALES
CONTRACTS AWARDED
MARKET VALUE
1000
NET WORTH
100
NET PROFIT
DIVIDENDS
10
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55
56
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62
63
64
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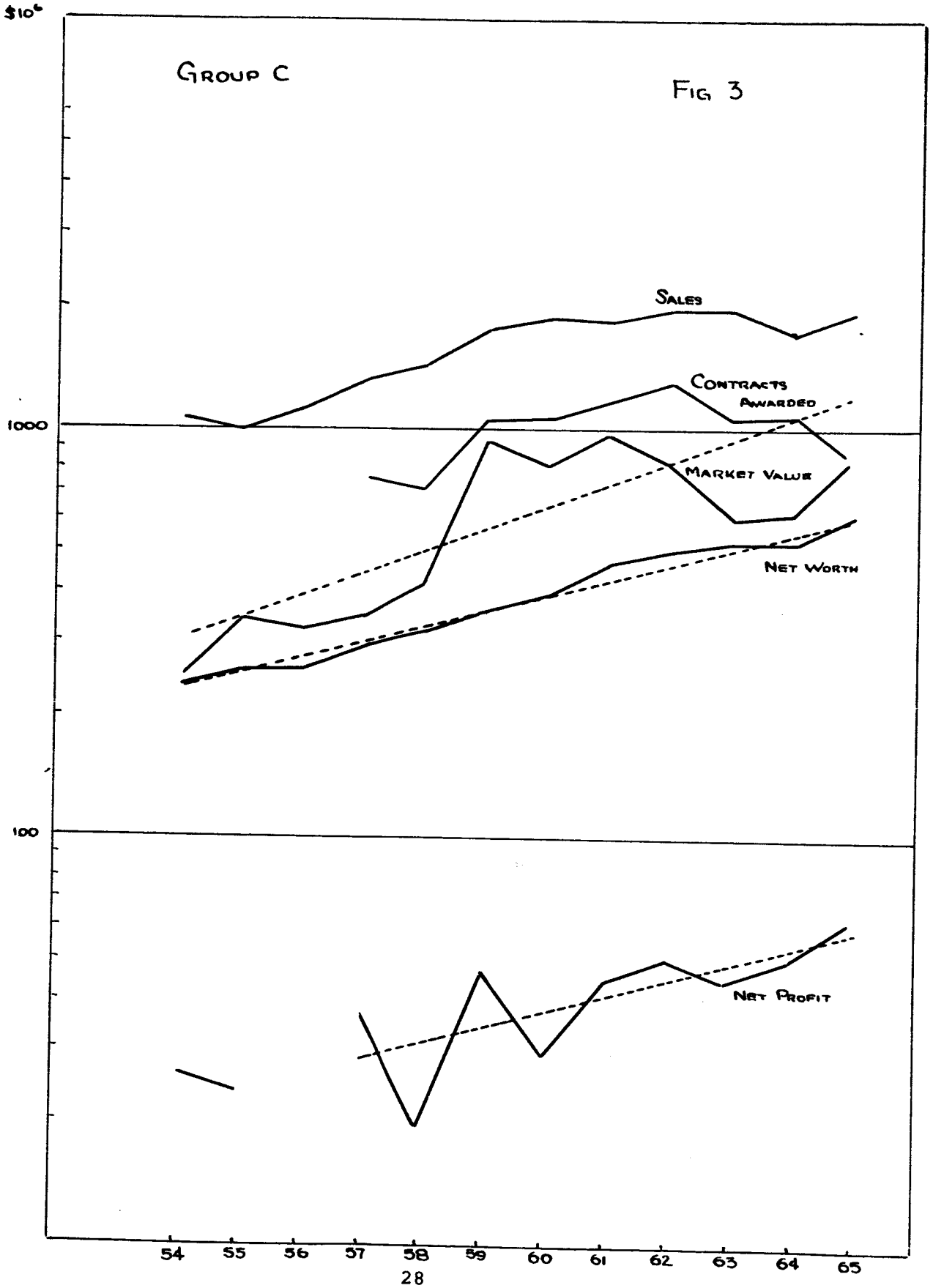
$10^6
GROUP C
FIG 3
SALES
CONTRACTS AWARDED
MARKET VALUE
NET WORTH
NET PROFIT
1000
100
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57
58
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64
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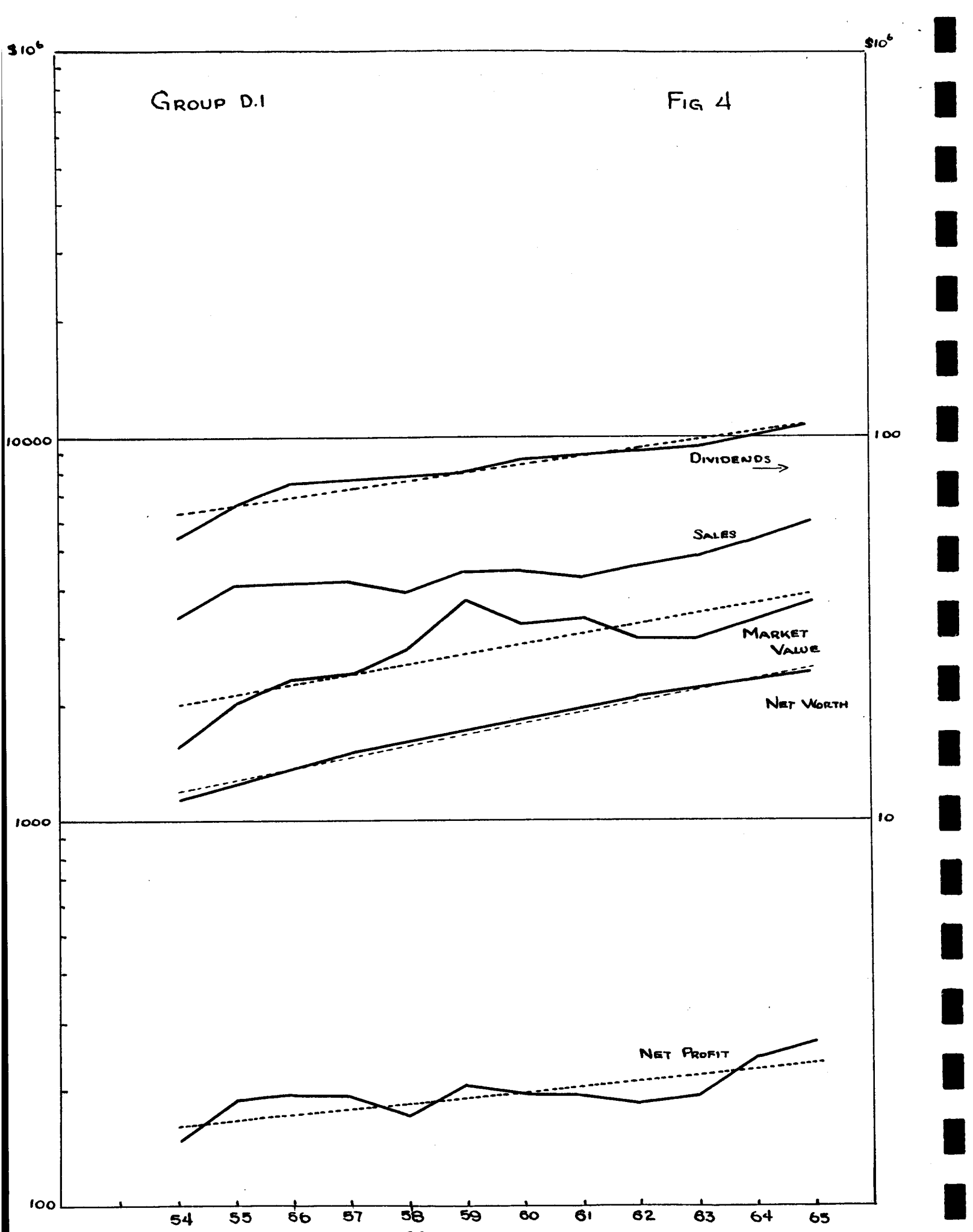
$10^6
$10^6
GROUP D.1
FIG 4
10000
100
1000
10
100
DIVIDENDS
SALES
MARKET VALUE
NET WORTH
NET PROFIT
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64
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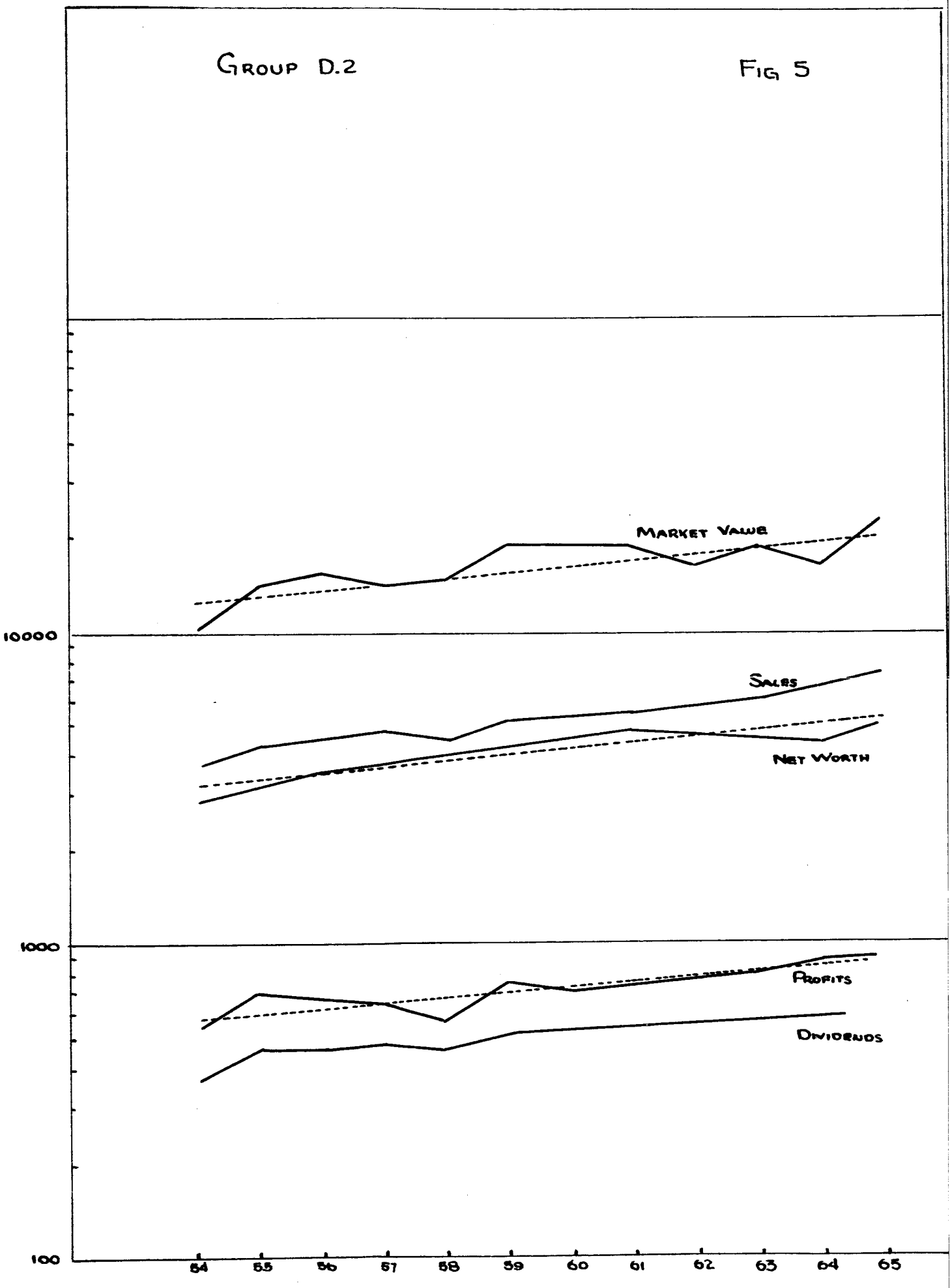
GROUP D.2
FIG 5
MARKET VALUE
SALES
NET WORTH
PROFITS
DIVIDENDS
10000
1000
100
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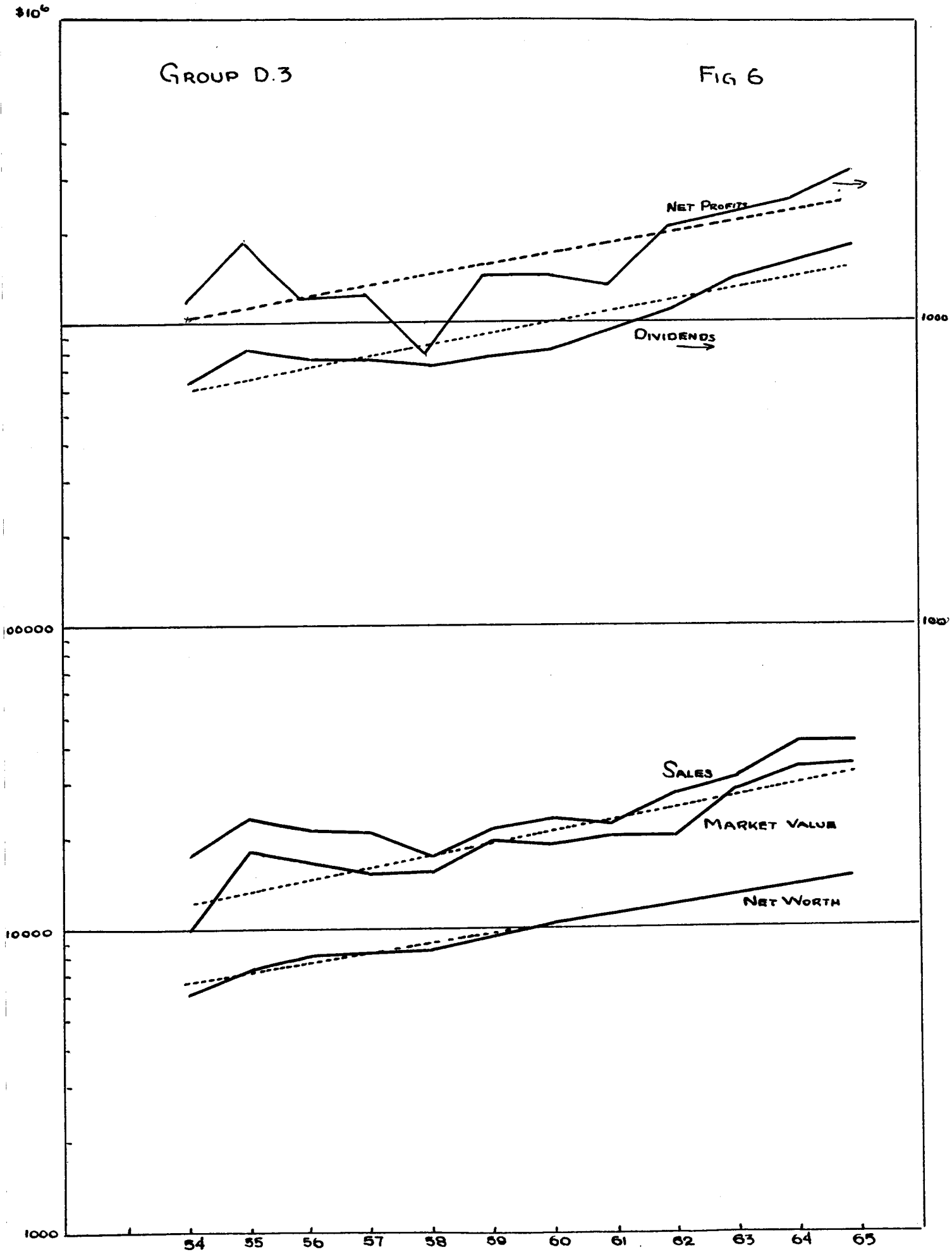
10^6
GROUP D.3
FIG 6
NET PROFITS
DIVIDENDS
1000
100
00000
SALES
MARKET VALUE
NET WORTH
10000
1000
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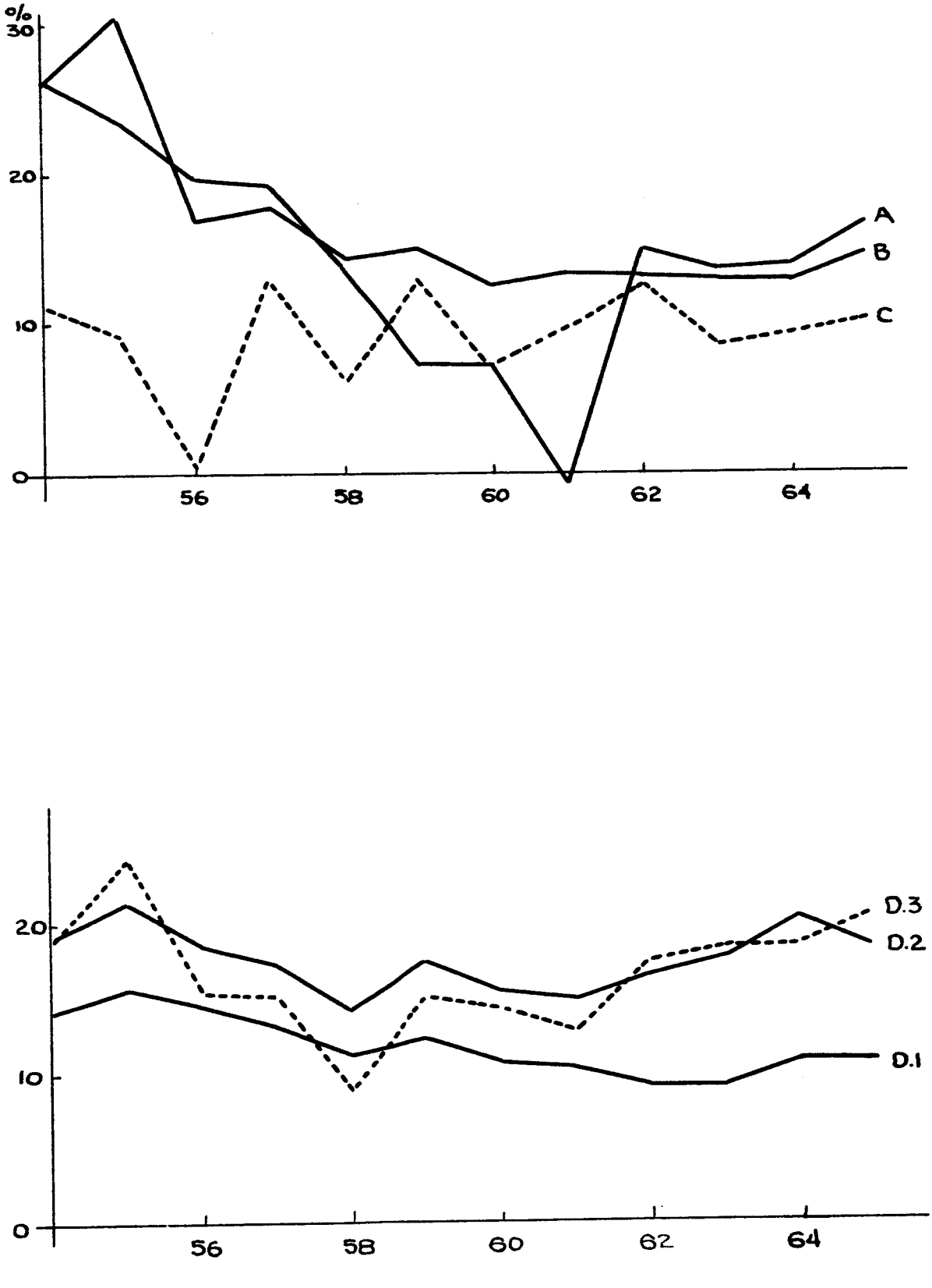
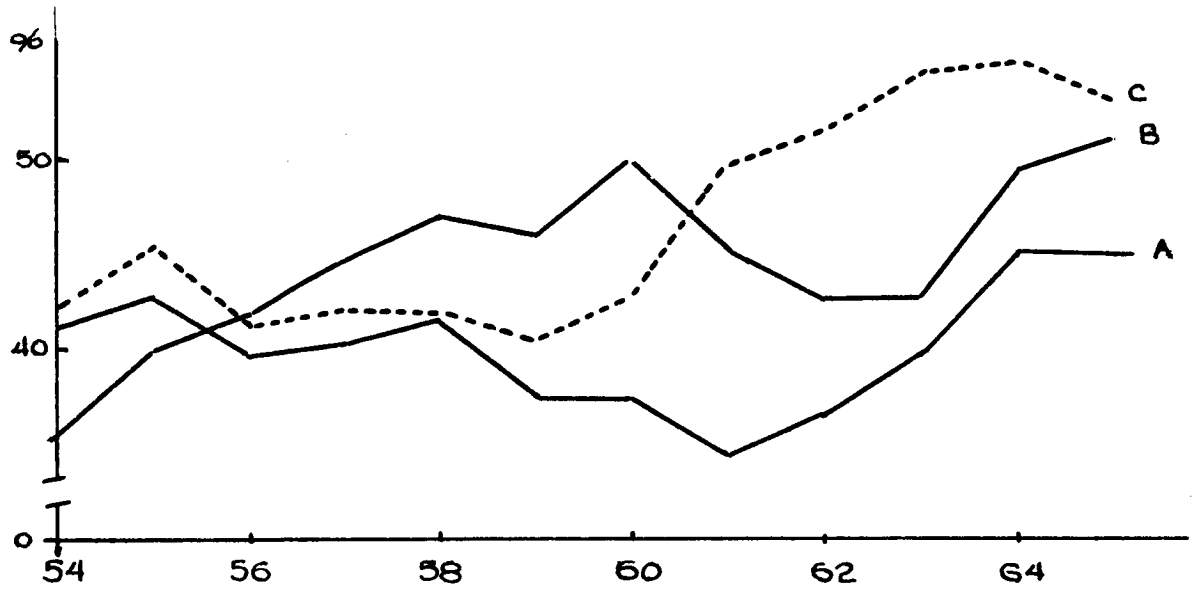
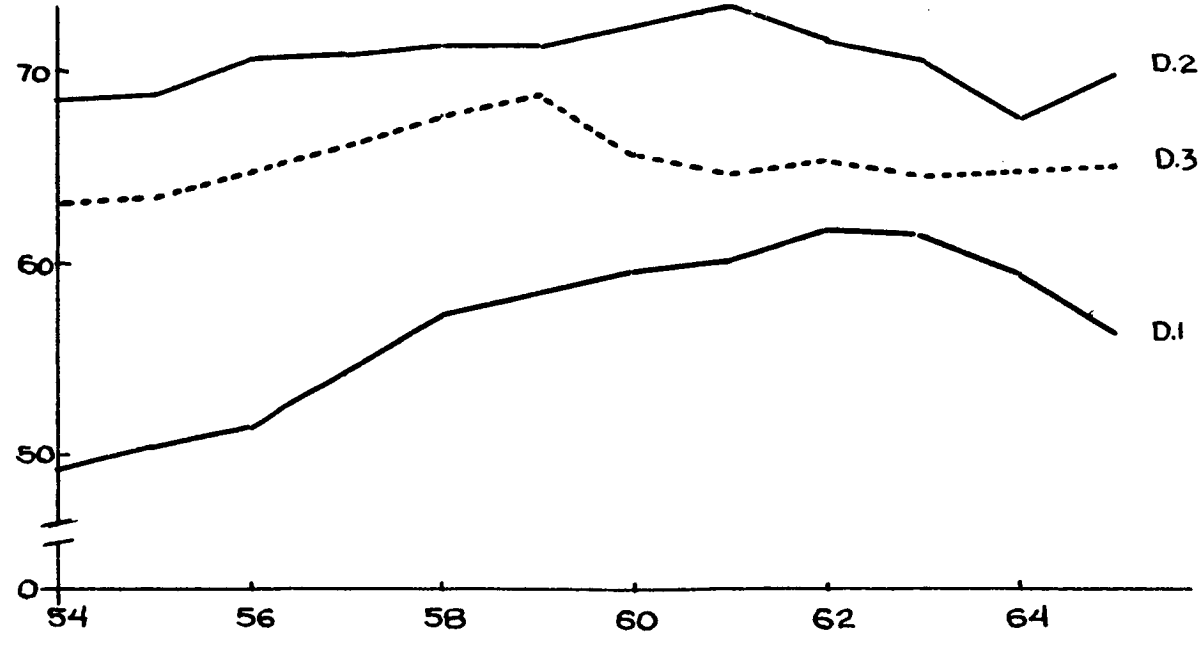
FIG 7



RETURN ON NET WORTH

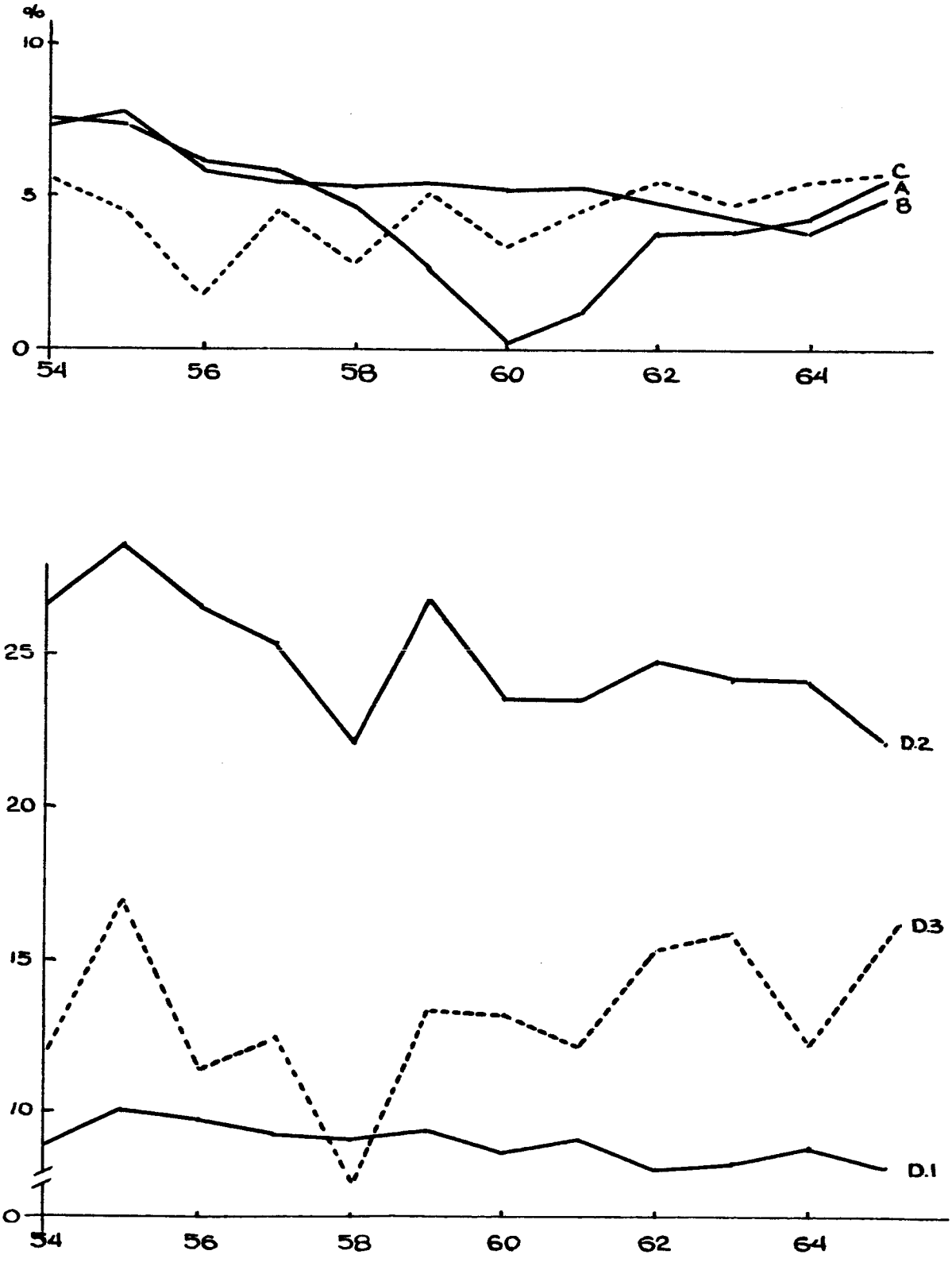
FIG. 8





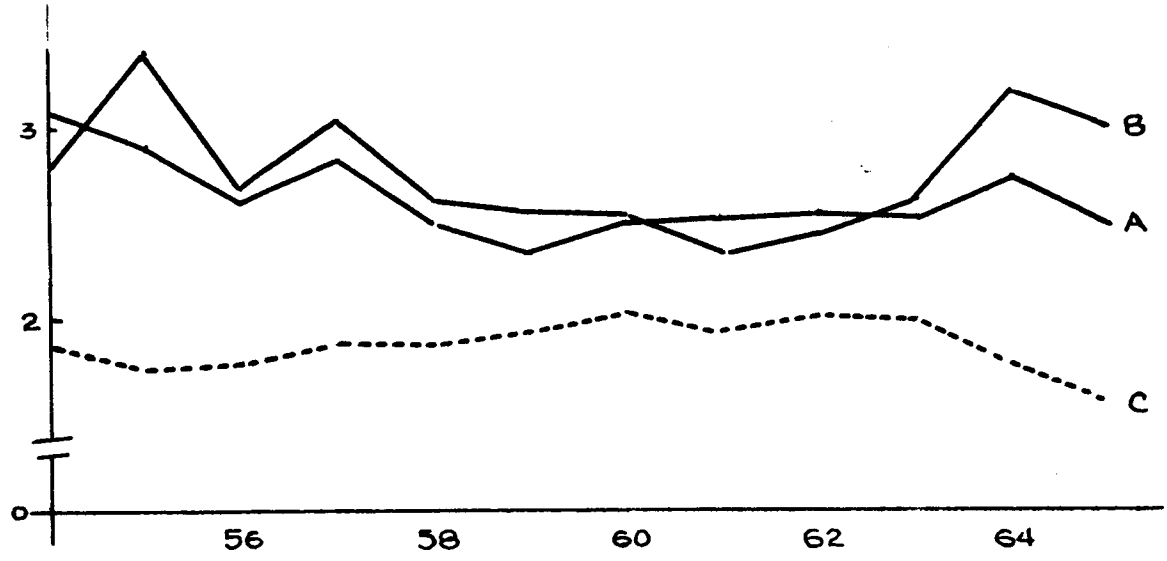
EQUITY TO TOTAL ASSETS

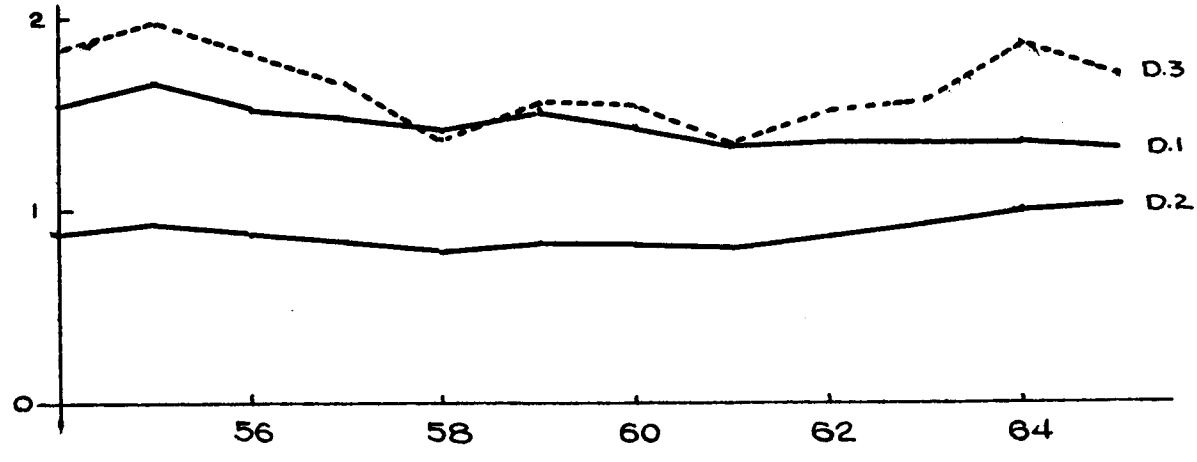
FIG. 9



MARGINS

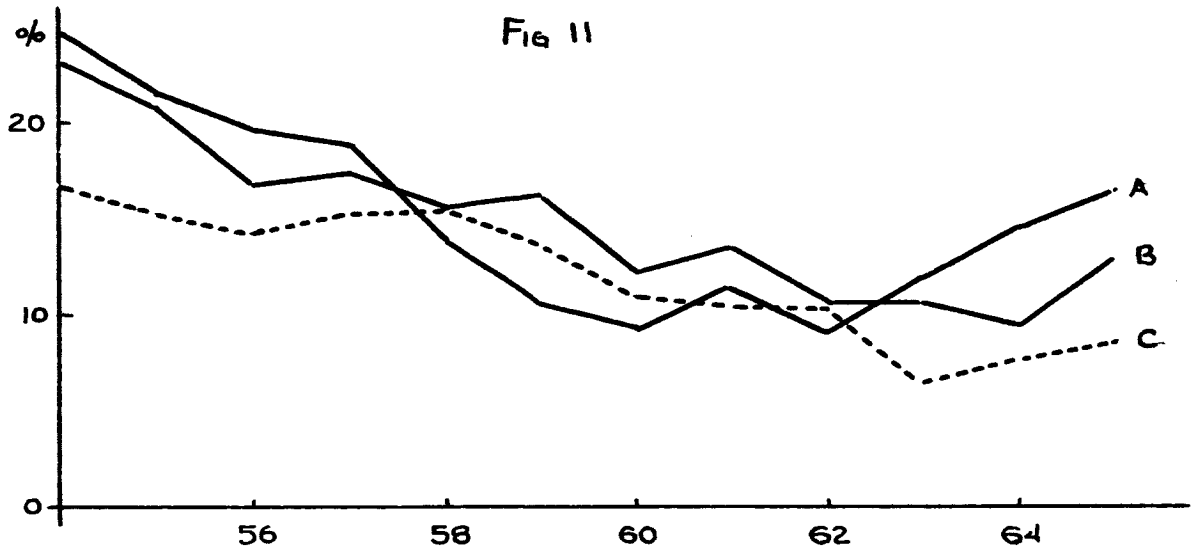
FIG 10





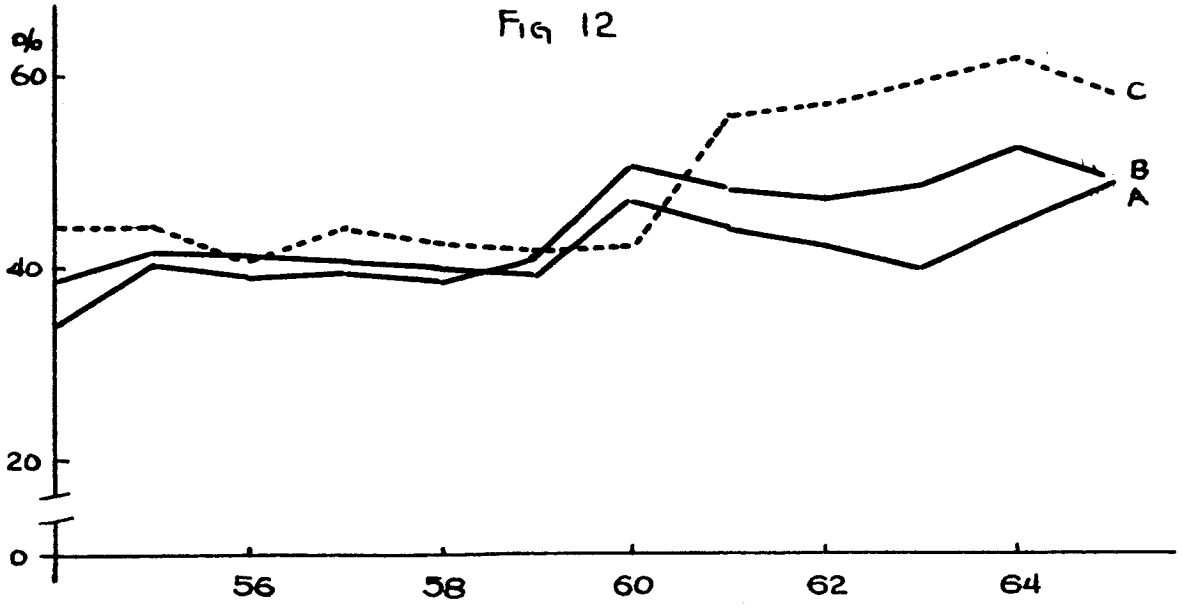
TURNOVER - TOTAL ASSETS

FIG 11



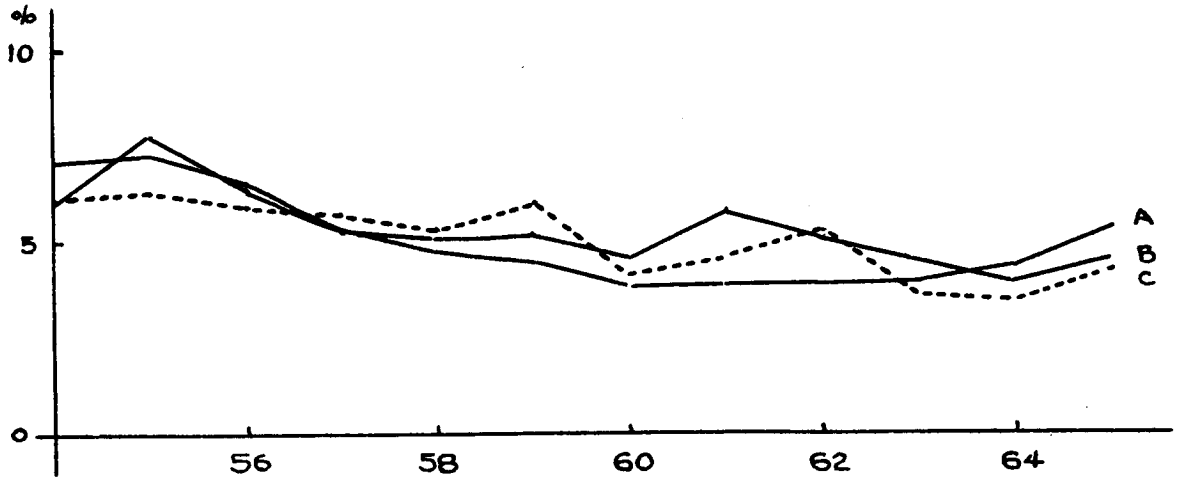
RETURN ON NET WORTH – MEDIAN RATIOS

FIG 12



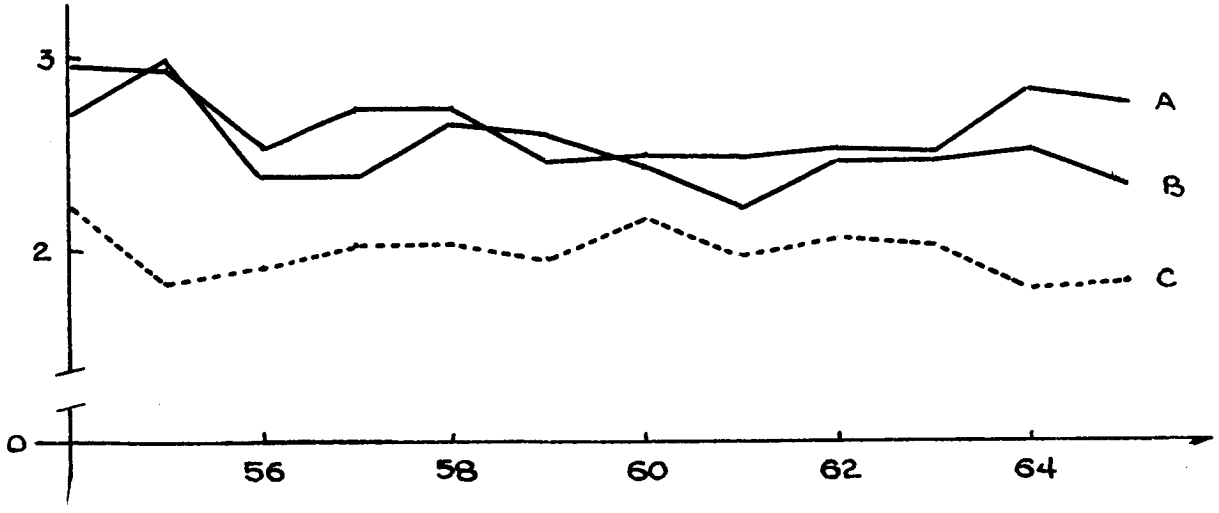
EQUITY TO TOTAL ASSETS – MEDIAN RATIOS

FIG 13



MARGINS - MEDIAN RATIOS

FIG 14



TURNOVER - MEDIAN

PART I-b

A Measure of Capital Cost

The Economist's Concept of Profit and Value

The economist's measurement of profit differs from that used by the accountant. The profit rate to the accountant is the residual income (after costs, including taxes and other obligations) divided by the total equity capital. The value of an asset is represented by the book value of that asset, which is based on its cost. The economist would argue that an asset has no value whatsoever unless it has future earning power; i.e., unless it will generate a future stream of earnings. The size and the timeliness of this future stream of earnings determines the value of the asset. Net income is essentially a speculation about the future, and the responsible assets have a value which is a function of this future earning power.[9]

A study of comparative industry incomes using the economist's definition of profit is necessarily involved with measuring the future earnings stream of assets. Since we are also concerned with historical profit performance, the return on a capital asset is therefore given as the discount rate of the subsequent earnings stream to that investment. Therefore a method for measuring return on investment would necessarily depend upon the theory of compound interest.

Cost of Capital

Under market conditions involving complete certainty of profit outcomes, the cut-off rate (or the cost of capital) would be the prime interest rate. (In fact, there

9 See Joel Dean /5/ for a discussion of the conceptual conflict between the economist's and the accountant's definition of profits.

would be only one interest rate.) However, under conditions of uncertainty, the investors will discount the future earnings stream according to the degree of uncertainty which they place on it, and the cost of equity capital will be higher than the interest rate. The cut-off rate or the rate at which investments should not be accepted (or the rate at which the investment would be an injustice to the stockholders) is determined through the market price of the stock. "An asset is worth acquiring if it increases the value of the owner's equity, i.e., if it adds more to the market value of the firm than the costs of acquisition." /18; p. 262/.

The traditional cost of equity capital is the reciprocal of the price-earnings ratio. (For an example of this usage see Soule, /24/.) There are situations where this ratio might be a pertinent and adequate measure - particularly when there is no growth in earnings. However, Nemmers /21; p. 385/ describes a particular problem which "is frequently overlooked in the literature of capital budgeting." A company which has an exceptional earnings potential will have its stock bid-up. This, in turn, will make the earnings-price ratio low. Therefore, a growth company will have a low cost of capital, or a low cut-off point. The opposite would be true for a firm with poor earnings expectations. But the value of the growth firm's stock is high because the stockholders expect the management to earn a rate considerably greater than the cut-off point as estimated by the earnings-price ratio. And vice versa; poor earnings expectations will cause the price of the stock to decrease, often resulting in an increase in the earnings-price ratio. The earnings-price ratio tends to vary inversely with profit rate expectations and the cost of equity capital as measured by the traditional earnings-price ratio leads to basic inconsistencies. This is the primary motivation for seeking a measure which incorporates the growth or expected growth of the earnings.

Cost of Equity Capital Involving a Growth Factor

The basis for the following analysis was derived from a paper by Gordon and Shapiro [9]. As in most recent developments in capital, theory their method is based upon compound interest theory and the assumption the value of any asset is determined by the future earnings derivable from that asset discounted at a proper rate. The market value of a share of stock in the time period zero, V_o, is

$$V_o = \sum [D_t (1 + k)^{-t}]$$

where D_t is the total dividends paid in period t and k is the discount rate, or rate of return. The rate of return, therefore, is determined from the present known price and the expected future dividends. The authors made certain assumptions: (1) the dividends are paid continuously and are, accordingly, discounted continuously, and (2) the dividends will grow at an exponential rate. Continuously discounting dividends with an exceptional growth rate results in the following expression:

$$V_o = \int_o^\infty D_o e^{gt} e^{-kt} dt$$

$$= D_o/(k-g) \qquad (1)$$

where D_o is the dividends in the initial time period and g is the exponential growth rate.

The Question of Earnings Versus Dividends

Innumerable pages have been written on the subject of investor objectives in purchasing securities. There is particular disagreement on the issue of whether the investor purchases a discounted stream of future dividends or a discounted stream of future earnings. Graham and Dodd, in one of the classic texts on investments [10], maintain that dividends have an influence on the market price of the share that is three times greater than that of earnings. Other capital theorists support this argument [8], [4]. The assigned relative importance to dividends is

apparently derived from considerable regression analyses of stock prices, dividends and earnings. The net results of these regression models have been regression coefficients with the relative size of 3:1 for dividends and earnings respectively.

Other capital theorists argue, conversely, that earnings are more important. [25], [6]. A recent paper by Friend and Puckett [7] presents a convincing argument that the earnings, not dividends, are the more important influence on stock prices in about the reverse ratio; i.e., earnings are about three times as important as dividends in the stockholders evaluations. Their arguments are based upon a careful consideration of the biases inherent in regression analyses which might have led to the results accepted by the "dividend proponents." But they further develop rational arguments as to why dividends are not as important as earnings to the stockholder's evaluations. Not the least important of their arguments is the obvious inconsistency of the dividend-motivation hypothesis with observable investor attitudes. During the last several years there has been a considerable market interest in growth stocks, and few analysts and students of the market are other than skeptical of the importance of dividends on the market price of the stock. There have been several instances of dividend rates on high grade stocks less than the interest rate of good quality securities, and a Merril Lynch study (quoted in [7]) indicates that capital gains are of primary importance to the stockholder. But the authors also point out that the behavioral assumptions necessary to support the

thesis that dividends are more important than earnings are quite suspect.[10]

> This lower evaluation (on retained earnings) could exist if any one of the following situations is present: (1) the average holder of common stock possesses, at the margin of his portifolio, a very strong preference for current income over future income (a situation which could hardly be expected to persist over time);(2) the expected increase in earnings arising from increased per-share investment is viewed as involving a much higher degree of risk than that attaching to earnings on existing corporate assets; (3) the profitability of incremental corporate investment, as viewed by shareholders, is extremely low relative to the competitive yield prevailing in the stock market. However, neither of these assumptions (the first two) is consistent with observed behavior of the market. /7, p. 658/

While the subsequent analysis will adopt Gordon's basic formula (actually a well-known actuarial formula), expected earnings will be used instead of expected dividends.

$$V_o = \int_o^\infty E_o e^{bt} e^{-rt} dt = E_o/(r-b)$$

$$r = \frac{E_o}{V_o} + b \qquad (2)$$

The value of r is a measure of the cost of equity capital. The responsibility of the manager for the stockholders' capital is defined as that of maximizing the value of the company, and the cost of capital is a rate of return below which mana-

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[10] Joel Dean notes /5, p. 575/ that dividends are paid to keep stockholders passive and management enthroned. The plow-back earnings are the "pure" earnings. This observation seems reasonable in view of the customary stable dividend policies of corporations. On the other hand, examination of Figures 1-6, indicate that net worth as a function of time has a remarkably uniform linear appearance on semi-log paper. This indicates strongly that the managers are deliberately reinvesting a given percentage of the previous year's book value - i.e., they are maintaining a constant exponential growth rate. This, in turn, would indicate that a stable retention rate has precedent over a stable dividend rate. In any event, it is difficult to be convinced that the purchaser of common stock is primarily concerned with the dividends.

gers should not accept investments involving equity capital.[11]

Students of capital theory may object that (2) is incomplete since it avoids (an even more controversial area) the measurement of capital cost when both debt and equity capital are combined. This paper has objectives which differ from those of the corporate manager who must decide between various investment opportunities and the nature of the financing. The concern here is with the net results which accrue to the stockholder given the particular environment in which they were generated. Whatever the factors which influence the earnings stream, the stockholder will determine its expected growth and the uncertainty attached to it and will bid the price of the stock accordingly. Differences in the rate of return on the market value of the stock, or the cost of capital, should represent incremental differences in the evaluation of risk which the market attaches to the collective securities of each industry-group. (Similar to the assumptions made by Modigliani and Miller /18/, each industry-group in the study is assumed to constitute a homogeneous risk-class).

There is another possible objection to (2). The cut-off rate is the point at which the stockholder, theoretically, is equally benefited from receiving his earnings as dividends or having them reinvested. However, earnings reinvested are not subject to personal income taxes and, therefore, the cut-off rate should be adjusted for an income tax increment. In view of the fact that the data used constitute broad industry averages and our interest is in a comparative analysis, an adjustment for the tax rate appeared to be an unnecessary refinement.

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[11] For a statement of objectives commensurate with capital management, see Solomon /23/ and Modigliani and Miller /18/.

Historical Measures of Performance

A man's earnings can be viewed as a life-time annuity which he receives in periodic shares. The present value of this annuity at any time in his life is the discounted subsequent installments on this annuity. The present value can be determined from the expected future earnings, or it could be determined by the same procedures after his demise - which is equivalent to the assumption of "perfect foresight." For a corporation, which can be assumed to have perpetual life, the earnings stream can be assumed to continue to infinity. Therefore the value of a firm's assets at any point in time is, equivalently, the discounted profit stream accruing to these assets. However, the point in time for evaluating the assets is not necessarily restricted to the "present" - it can involve prior periods for which part of the earnings stream has been observed.

The use of a discrete function demands the estimation of an infinite series of periodic earnings. However, the use of a continuous function /as in (2)/ requires, instead, the determination of the growth rate and the nature of the earnings function with time. It may be argued that the earnings function is better represented by a growth function (such as the logistic) than by an exponential. However, the earnings trends seem well represented by the exponential function for the period studied and for the near future. (See Figures 1-6). Also, the earnings growth rate is such that for most groups studied, the discount rate is comparatively high, which in turn means the earnings of the more distant years becomes heavily discounted and comparatively inconsequential. While other functions are theoretically more sound, the exponential function appears adequate for the present analysis.

If N_o is the book value of the firm (or the industry group) for any selected year, then

$$N_o = \int_o^{\infty} E_o e^{bt} e^{-\rho t} dt = E_o/(\rho - b)$$

$$\rho = (E_o/N_o) + b \qquad (3)$$

The profit rate, ρ, is therefore determined by the return on equity for any selected year plus the growth rate. This measure of return on capital involves the expected or subsequent profits stream. Besides offering a conceptually preferrable measure, it avoids inconsistencies similar to those associated with measuring the cost of capital with the earnings-price ratio. For example, it is quite possible for two firms exhibiting identical values of E_t/N_t to have widely differing earnings expectations - even parameters with opposite sign. As measured by (3), the rates of return would be different.

If the use of the exponential function is defensible for the expression of earnings growth, it remains to determine the parameters E_o and b. In our analysis this was accomplished by a least-squares fit of an exponential function to the empirical data. As stated, in most instances it would appear that an exponential function is a fairly uncontestable function - at least for the period examined. Its adequacy for the future years is briefly discussed later.

The applicability of (2) as a measure of historical cost of capital presents additional problems. Unlike the measurement of ρ, the estimate of r does depend upon a representation or measure of market expectations at any one given point of time. The smoothing of historical earnings data does not necessarily provide an unbiased representation of the expectations of the market at some instant. For

example, during a time period in which the historical earnings are adequately represented with an exponential trend and a positive exponent, the market, on the average, could have been anticipating a different growth factor, even a negative one. This example seems to imply a rather extreme situation and, over a reasonable time period, the expectations regarding earnings should on the average oscillate about the rate as empirically determined by fitting a function to the data. This assumption is critical to the analysis developed here.

There are, then, two interest rates, one which discounts the earnings stream to a given book value and another which discounts the same earnings stream to the market value of the firm. It appears that a useful comparison can be made between the two interest rates. Two different firms (or industry-groups) would have the earnings streams discounted at different rates by the market depending upon the uncertainty which is attached to that stream of earnings. If one grants the previous assumptions (that the market anticipates the earnings growth as exponential and with the rate as empirically determined), two firms with identical interest rates, r, should be interpreted as being in the same risk class. The ratio $z = r/\rho$ would be an index of the extent to which the market "discounts" the actual rate of return on equity capital in order to achieve the acceptable rate of return. In other words, a value of $z = 1.0$ would indicate that the actual return on capital for the particular industry group is equivalent to the rate of return which the market associates with a given uncertainty of earnings; a value of $z > 1.0$ would indicate that the investments are yielding less than the cost of capital.[12]

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[12]There is a considerable similarity in this measure and the C/A ratio used by Prof. Huntley in Section III.

A measure or index of relative performance might be derived from the ratio z. A firm which makes a return on book value in excess of what the market requires for that risk class of security will have its stock bid-up accordingly. The smaller the value of z, the greater the relative profit performance, i.e., the greater margins by which the actual rate of return exceeds the required rate of return. This is, therefore, a measure of relative profit performance adjusted for uncertainty, and the evaluator of the uncertainty or risk is the market place. While this measure obviously provides no absolute criteria to evaluate good or bad performance, it will allow a ranking in terms of profit performance or investment opportunities. So far as government policy is concerned, if the ratio is approaching 1.0 it would indicate that the profit outcome is becoming marginal, or that the actual rate is approaching the cost of funds; i.e., a rate at which the manager is justified in paying earnings to stockholders rather than retaining and investing it at the present rate of return.

The Empirical Determination of r, ρ, and z

Our comparative analysis is concerned with the net worth (book value), market value of common stock, and net earnings after taxes. The data used were the annual totals of the above measures for each industry grouping. The data were first plotted on semi-log paper. Our model (as previously explained) assumes an exponential growth in earnings. The linear appearance of the functions indicates that an exponential function is a reasonable assumption. The parameters of the function

$$E(t) = ae^{bt}$$

were determined from the earnings data of each of the industry-groups. The value of b, of course, represents the growth rate of the earnings. The values of r and ρ can then be determined from equations (2) and (3). Any of the 12 years included in the investigation can be selected as the period t=0. (In other words, we can determine the values of r and ρ for any given year by the substitution of the earnings net worth and market value for the year.) However, rather than compute r and ρ for individual years, an "average" book value (N) and market value (V) are also expressed as exponential functions of time. (The nature of the function is clearly indicated in Figures 1-6.) Therefore[13]

$$N(t) = ce^{dt}$$

$$V(t) = fe^{gt}$$

$$\rho(t) = (ae^{bt}/ce^{dt}) + b = (a/c)e^{(b-d)t} + b$$

$$r(t) = (ae^{bt}/fe^{gt}) + b = (a/f)e^{(b-g)t} + b$$

Our examination covers the period 1954 to 1965. The parameter values for the above functions are presented in Table 3. The derived values for the functions ρ(t), r(t) and z(t) are given in Figures 15.

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[13] It is apparent that N(t), V(t) and E(t) are not independent functions as their use here implies. However, these equations are developed to examine the changes in these ratios over the time period, and the assumption of independent functions is a convenience.

Table 3
Parameter Values for E(t), N(t) and V(t)

	a	b	c	d	e	f
Group A	180	.040	866	.078	1489	.066
B	53	.050	340	.095	404	.112
C	29	.087	231	.065	309	.106
D.1	161	.034	1200	.049	2010	.061
D.2	583	.040	3170	.075	12850	.045
D.3	1136	.075	6800	.088	12130	.091

Parameter values for a, c, and f are $\$10^6$

A Digression on Trend Extrapolation

All of the industry-groups showed pronounced increases in earnings between 1964 and 1965. The Federal Reserve Index of aerospace production began a steep rise about the middle of 1965- which coincided with developments in the Southeast Asia involvement. (See Aviation Week, March 7, 1966, p. 65). The increases indicated in the other, nonaerospace groupings coincide with the general prosperity (and inflation) which was evident in this period.

The question remains as to whether the functions and parameters based upon the past 12 years are proper expressions for the near future. Expansion of our military effort in East Asia would, of course, maintain the more rapid increase in the over all aerospace production (and profits) evidenced in 1965. Also, during the last few years, the procuring agencies have followed a definite policy to raise fees; this effort may be limited, but it should contribute to a somewhat

higher profit pattern for subsequent years.[14] On the other hand, as shown in Figures 8 and 12, the ratio of net assets to the total assets has been increasing. The fact that net worth has been increasing faster than profits may be due to government's decision to furnish the contractors with less government capital. /2, pp. 67, 69/. The general shift to a greater equity base is not likely to continue indefinitely into the future. A reduction in the rate at which book value is accumulated in relation to earnings would increase the return on capital. But this is essentially implying that the industry can expect their investments to yield a greater rate of return - that the growth rate of equity will decrease while that of profits remains unchanged. It is likely that any material change in the earnings rate would depend upon continued expansion of the present crisis atmosphere. On the other hand, it would not appear that even a satisfactory cease-fire development in Viet Nam would cause any levelling or down-trend in the 10-year growth picture; i.e., such a political development would warrant the assumption of a growth rate similar to those exhibited by the present pattern. In short, it would appear that the present growth rate would form a reasonable lower bound to the near future earnings growth. The profits of the large aerospace firms are also affected by their commercial or non-government sales. Without a detailed analysis, it would appear that the development of supersonic and large cargo aircraft would dominate this nongovernment

[14]The development of weighted guide-line pricing and the emphasis on incentive contracting is definitely related to this objective. In fact, we believe that any measure of the efficency of incentive contracting should be related to its influence on the margin outcomes rather than to efficiency. This objective of price flexibility is not publicized; disguise of these objectives of procurement policy is quite rational and necessary.

picture and, for the industry as a whole, support the estimated profit trends, at least for Group A.

An earnings prognosis for the nonaerospace industry presents more uncertainties. This writing coincides with two precipitous drops of the stock market. As interpreted by the Wall Street Journal (May 9, 1966), a primary causal factor was the general belief that earnings and production have been at a maximum level and any adjustment must be downward. It is reasonable to foresee the earnings trends for the non-defense industry levelling off in the near future, but after reviewing several nongovernmental prognostications of business conditions, there appears nothing to support a change in the long-term growth pattern in the near future.

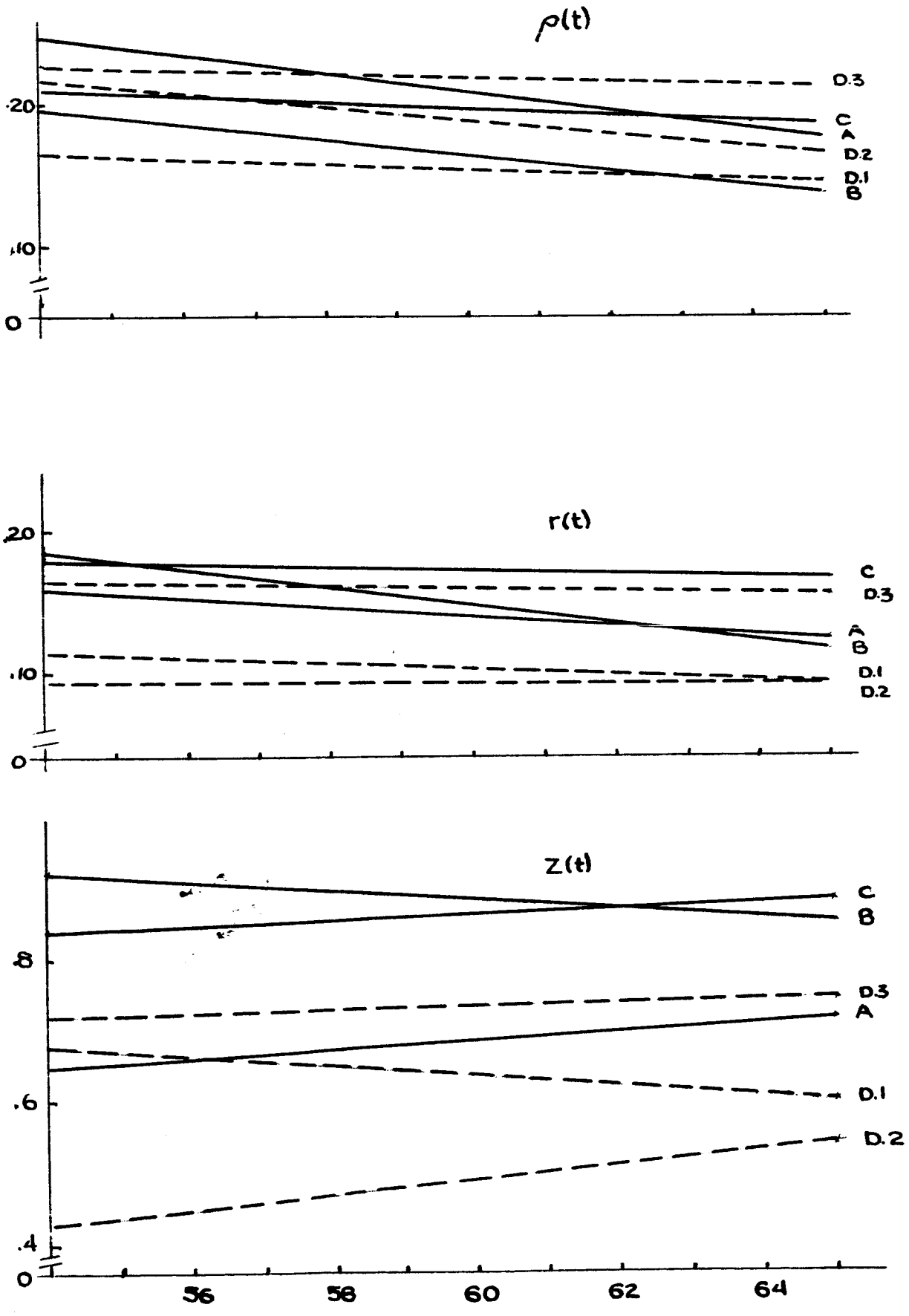
The preceeding arguments are not intended to substitute for the intensive study necessary to support predictions of future business conditions. They are offered to support a hypothesis that the "average" earnings functions which have been derived provide reasonable predictions for the near-term. Since continuous discounting places heavy emphasis on the near-term, especially at the interest rates considered here, the demands for long-term predictions are minimized.

Examination of the Measures $\rho(t)$, $r(t)$ and $z(t)$

The Return on Net Worth, $\rho(t)$

All of the industry-groups examined indicate a decreasing return on net worth by this measure. The decrease has been the greatest for groups A and B. This is not surprising in view of the exceptional profit "peak" experienced by the aerospace groups about the beginning of the time period studies here. The C-group maintains its high relative position because of a measure rapid growth rate

FIG 15


ρ(t)
.20
.10
0
D.3
C
A
D.2
D.1
B
r(t)
.20
.10
0
C
D.3
A
B
D.1
D.2
Z(t)
.8
.6
.4
0
C
B
D.3
A
D.1
D.2
56
58
60
62
64

in the earnings relative to the increase in net worth; all of the other declines in the measure of return were for the converse reason.

It is informative to compare these returns on capital with the profit goals which were reported by Lanzillotti and presented in Column 2, Table 2. All of the groups showed profit returns in the range of 12% to 20% - generally comparable to the expressed profit goals of the major companies. It is also evident that the rate of return for groups A, B, D.1 and D.2 are close to those determined in Section I, especially at the end of the period. This results from the comparatively small differences in their growth rates in earnings which changes their relative position in the rankings and size of the profit rates.

The Rate of Return on Market Value, r(t)

It is our hypothesis that the investors will bid-up the market value of a common stock until the accepted interest rate for a particular risk-class of stock will discount the expected after-tax earnings. Therefore stocks bearing the same interest rate (as measured by discounted future earnings) would be of the same risk class. At the beginning of the period, groups A, B, C and D.3 appear to group together while D.1 and D.2 are distinctly separate. If the smoothed exponential expression for earnings is an "unbiased" representation of the average earnings expectations, it would appear that early in the period studied the industry groups were divided into at least two distinct risk-groups. During this time period there appears to be a general change in the market's evaluation of the comparative risk of the groups in that the cost of capital for the large aerospace firms dropped to a position between the D.3 and C groups (auto and smaller aerospace) at the upper bound and the chemical and tire groups at the other.

This appears to be a consistent result. The aerospace industry as a whole, has experienced remarkable steady sales since 1954 and these prospects continue; the present defense and NASA budgets are unlikely to be altered drastically in the foreseeable future. Group C (the smaller firms doing more than 75% government business) which has the greatest irregularity of earnings, maintained the highest discount rate. The groups D.1, D.2 and D.3, have maintained a rather consistent discount rate over the period. This would be expected in view of the maturity of these industries and the market's knowledge of the nature of their earnings pattern. The data indicate that the aerospace group as a whole is now recognized as being somewhat less risky from an earnings point of view than the automobile group, yet remaining more so than the stable industries - tires and chemicals.

The Comparative Measure, z(t)

As explained earlier, the measure z(t) is the relative measure of the market rate of profit to the rate actually earned on net worth. Throughout this period the market has bid-up the price of the chemical stocks such that the interest rate on the market value is approximately 50% of the rate on the book value. (The contribution of the financial performance of the du Pont company to this outcome should be noted). This would indicate that the rate of return for group D.2 (and group D.1, at the end of the period) as a whole is considerably greater than the return the market expects on earnings with the associated risk. The ratio is considerably larger, however, for the other industry groups considered here. It is also apparent that the aerospace groups B and C have the highest values for the ratio z, while the A-group maintains a value approximately equal to that for the auto-group. The value of this ratio for the B-group decreased during the interval, but increased

for groups A and C. This is logical considering the profit experience of the firms which constitute each industry-group.

This measure indicates that the market rate of return is closer to the actual rate of return for Groups B and C than any of the other industry-groups exained here. This ranking, while providing no absolute measure of "excess" or "adequate", does support the hypothesis that these aerospace firms, as a whole, probably experienced a low profit rate compared to other firms in that their average rates of return on net worth were closer to the marginal rate. (The A-group, in its close-to-median position could be said to have "average" experience in this regard.) Conversely, there is nothing to indicate that aerospace profits, as a whole, were "excessive." (If for example, the rankings of the A and B-groups were interchanged with that of D.2, the aerospace group might necessarily be more defensive about the profit outcomes.) Similarly, the data serve to rationalize the procuring agencies efforts to raise margins during the later part of this time period.

Comments on Pricing on Return on Investment

The pricing of contracts with regard to the return on the capital invested has considerable appeal for procurement officials. The Army Audit Agency has strongly recommended this method of determining equitable contract prices; also the Army Audit Agency Manual Part IV, (as quoted in Prof. Coughlin's study /20/) instructs the auditors to determine and report the rate of return which the contractor is expected to earn on individual contracts. Our investigations have also indicated that this subject is periodically investigated in numerous segments of the procurement area, with the universal result that the method of pricing is

recommended by the study-group only to be rejected by management decision as being impracticable. A primary objection (there are others) appears to be the indeterminable estimate of the quantity of the capital employed on any given contract.

The previous discussion on cost of capital should indicate additional difficulties with pricing based on return on investment. Most schemes for such pricing imply that the rate of return would be based upon the interest rate - at least rates not greatly different than fee-rates now used. The proper return on capital must consider the cost of that capital; as stated, this cost is not the interest rate. If the government acknowledges the criteria followed by management in this regard (and it must in the end) the return on a given investment should not fall below the cost of the capital, and the cost of capital varies with and is determined by the market price of the stock. Thus the pricing of a contract would have the professed objective of supporting the price of the stock. The prudence of using such a pricing objective is questionable for a government agency. Furthermore, in situations in which the capital furnished is a mixture of debt and equity, the cost of capital does not have an agreed upon method of determination. (The subject is presently the center of controversy among capital theorists). It is apparent, therefore, that the negotiation of the cost of capital, in addition to the negotiation of the amount of the capital (plus other topics typically covered) would probably complicate the contract negotiations to an extent negating any benefit obtainable from a theoretically more exact pricing procedure.

The profit rate is a function of numerous procurement actions and

procedures - the frequency of the progress payments,[15] the secured loans, as well as the fee rate itself. If one wish to control the return on capital through the fee policy alone, it would be necessary to control, or make allowance for, the effects of the other procurement policies by which government contractors are able to obtain a greater return on investment than is evidenced in the fee itself. This would demand a capability for determining the net influence of a number of procurement policies on the profit outcome - a practical impossibility.

There are other possible objections to a fee policy directed towards a specific return of capital. Present pricing is based upon a determination of the direct costs (fairly unambiguous) and traditional, established overhead loadings. The latter cost determinations receive constant scrutiny by the auditors, but in general, it appears that the customary procedures lead to no particular controversies. Pricing with regard to return on capital introduces specific items of capital into the negotiation. Aside from the problem of obtaining agreement on these items among the contracting parties, the decisions in this regard becomes open to scrutiny and of possible concern to the GAO and other groups with similar interests. Any subject as controversial as the cost of capital is certain to invite unwonted disagreements.

But further, assume that the cost of capital can be divided into that portion

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[15]For example: In an interview with Dudley E. Brown, Lockheed Vice President, (Aviation Week, 11 April 1966, p. 26), he comments:

> The defense industry used to turn over its cash perhaps four times a year," .... "but now we may turn it over 250 times. But this gives us considerably less flexibility than we used to have. So if a financial officer hiccups and there's a delay in $1 million progress payment, it can mean dislocation."

obtained by debt capital and that obtained from equity capital. The payment for cost of debt capital involves payment for interest, which government procurement has traditionally denied. Ignore, for the sake of argument, the possible objections to covering interest payments in the fee as part of the cost of capital rather than as items of cost. Controversial as the subject is at present, general financial practice and concensus considers debt capital less costly than equity capital. Therefore, the greater the amount of capital raised through borrowing, the smaller the resulting fee; conversely, a firm with a higher percentage of equity capital would receive a higher fee. This would eventually result in the capital structure of the firm being subject to inquiry and possible criticism and negotiation.[16] In addition, there are other factors producing the variations in the cost of capital. A firm with uncertain earnings prospects (or high uncertainty of earnings) will have a higher cost of capital, and vice versa. This, in turn, could easily lead to different rates being paid for the same product, depending upon the firm selected.

If most of the technical and administrative problems involved with pricing on invested capital were resolved, there remains a final, unresolved and important issue - the one which led to the interest in this form of contract pricing in the first place. The minimal rate is not necessarily the "correct" rate. There are numerous reasons why firms might not wish to accept investments with yields as low as the marginal rate. But more important, the cost of capital does not

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16 These remarks are quite applicable to an immediate and continuing controversy as to whether interest payments should be properly allowed as a contract cost. If interest payments become a cost item, then those firms with greater percentages of borrowed capital incur potential criticisms, along with their cost and methods of financing.

provide even a definitive base-point for contract fees unless all of the investment opportunities of the contractor are completely homogeneous as to risk and the contractor accepts investment opportunities which yield down to the marginal rate. The contractor negotiates contract terms based upon a subjective density of cost outcomes and a utility function for fees. Although the latter may (and should) be related to the cost of capital, the relationship will be undefinable as will the subjective function upon which the contractor negotiates. At best, the measurement of the cost of capital provides a complex method of arriving at an initital bargaining position -- not the final one.

Summary and Conclusions

The first portion of the paper (Part I) examines a selected series of balance sheet items for selected industry groups. The data are time-series, and the period 1954-1965 was chosen as representing the longest period occupied by the aerospace industry as a mature "full-time" supplier of weapon and space systems. The industries were selected from the top 100 contractors ranked according to government sales and analysed as homogeneous subgroups - the A-group being the "large" aerospace firms; B-group, those firms with more than 90% government sales; D.1, tire manufactures with less than 25% government sales, etc. All further reference to groups will include those defined in Part I, p. 13.

The data analysed and presented in Part Ia illustrates characteristics of the aerospace industry which have been noted before. It is well known and well recited that margins are lower in the aerospace industry than in any of the other industry groups equivalent in inherent technology and nature of production. This

phenomena is evident here; the aerospace groups had lower margins by a considerable amount than the "D-group" or those firms having a small percentage of government sales. Most U.S. industries experienced a drop in margins through this period (1954-65) and, of the industry groups examined herein, only the auto-group indicates an increase.

Turnovers as measured on total assets appear to remain fairly stable for most of the groups. They are the highest for A and B (approximately 3.0), and lowest for the chemicals (approximately 1.0).

The aerospace industry remains one of the highest "levered" groups in terms of equity to total assets, but the ratio of equity to total assets appears to be rising.

The return on equity capital, as measured in the traditional accounting manner, has decreased for all of the industry groups studied between '54 and '61. The return on equity remained at approximately the '61 rate thereafter, for groups B and C; it declined for group D.1 and rose for groups A, D.2 and D.3. The B-group (firms with more than 90% government sales) indicates a stable rate which, in turn, is evidence of the high percentage of government sales in this group. The large "dip" in the profit rates for the A-group is explained by the write-offs (taken by several of the firms) resulting from losses on non-government sales. (This phenomena is particularly influenced by General Dynamics). If allowance is made for this dip (which is pertinent in a paper primarily interested in profit experiences on government sales) the rate of return for this group would probably be quite similar to that for the B-group. At the end of the period, the

chemical and auto industries were returning about 20% on equity, the A and B groups, about 15%, the C-group and the tire group about 10%.

The growth in the percentage of equity capital was greater for the B and C groups than for the A-group. The former contain a greater proportion of smaller firms, at least initially in the period and the more rapid growth in equity from retained earnings is to be expected.

This comparative study is necessary background for the objective of the paper. However, one might make the observation that the profit outcomes of all the industry groups are within the range of profit objectives which were presented in Table 2. Also the profit outcomes for the aerospace groups fall below the chemical and auto industries but are higher than those for the tire group. Prima facie, it would appear that the profits for the aerospace group were commensurate with other industry during the period - but it would not be reasonable to expect the over all outcome to be greatly different.

Part Ib was devoted to a measurement of a marginal rate of profit - a profit rate limiting the manager's acceptance of investment opportunities and, therefore, a rate above which capital should be "attracted" to the industry. Theoretically, this marginal profit rate is subject to measurement (if with difficulty) and would provide a reasonably definitive bench-mark for judgment of the profit outcome. The emphasis, however, is on the rationale of examining the cost of capital for the purpose of policy review of procurement actions. The actual measurement of capital cost remains difficult and equivocal, and the method developed in section Ib for determining this statistic is exploratory. Further investigation of techniques of measuring capital cost should be made.

A rate of return was determined on both the book value and the market value of the different industry-groups. The rankings in rates of return on equity were, generally speaking, similar to those derived in Part I; this is partially explainable by the uniformity in the growth rates of earnings of four of the industry groups. Changes in ranking can be noted for those groups with high growth rates in earnings - groups C and D.3.

The cost of capital for the aerospace groups and the auto group were approximately the same at the beginning of the period. By the end of the time period, the cost of capital had decreased for the A and B groups to a position between that of the auto-group(D.3) and the D.1 and D.2 groups. (The latter two groups, /tires, chemicals/, representing mature industries with stable earnings patterns, have the lowest cost of capital of the groups studied.) This measured change in the cost of capital indicates a decrease in the uncertainty attached to the aerospace earnings by the market.

During this period the aerospace industry-group experienced rates of return on investment closer to the marginal rate than did the other groups. This ranking lends support to certain conclusions. It would appear particularly difficult to argue that, on the average, the aerospace industry had "excessive" earnings if their actual rate of earnings was closer to the capital cost than for any of the other groups, especially at the end of the period. Similarly, it would appear that the judgment of the government procuring agencies to raise fees through a multiplicity of procurement actions is justified.

The investigations involving capital cost lead to observations on the pricing of contracts. Pricing schemes which base the contract fees upon the capital

involved must obviously depend upon some appropriate rate of return. Many proponents of this method of pricing appear to anticipate a rate of return not greatly different from the interest rate. If the contract pricing philosophy is that of paying a "minimal" rate that would attract capital, this rate would, in all cases, be higher (often much higher) than the interest rate. Furthermore, the rate would necessarily vary with each contract and involve controversial negotiations on such ambiguous topics as the measure of the uncertainty of the cost outcome, the relationship of this measure of uncertainty to that which the market places upon the rest of the firms earnings stream, etc. An estimate of the cost of capital adequate for managerial decision, or for use in evaluating procurement policy, is not an ideal subject for negotiation. Pricing formulae based upon capital investment does not appear to be a desirable development in government procurement.

Measures of Profit Performance of NASA Contract Award Receipients

by Patrick Ross Huntley

Introduction

Whenever changes in NASA contract pricing and profits policies and/or regulations are under consideration, the review that NASA officials engage in should take into account the impact that contemplated changes will have on the financial health of contractors accepting government business. This point is especially cogent with regard to those contractors whose revenues derive primarily from government contracts. These points do not go unnoticed by NASA officials, and indeed, even when changes are not being considered, they are continually mindful of those influences on contractors' financial positions that stem from NASA contracting practices. These topics are critical parts of NASA officials' continuing interest in improving upon existing contractor selection procedures.

Despite their keen interest, however, and despite also the considerable counsel that NASA officials receive from many sources, they remain dissatisfied with the present status of their pricing and profits policies. Doubtlessly this state of affairs is partly a reflection of the difficulty persisting in the social and behaviorial sciences of finding statistics that will provide definitive, unambiguous answers to basic questions. Moreover, quite understandably, NASA officials prefer -- and hence seek out -- a statistic that is simple, albeit effective in providing a basis for choosing among contractors.

NASA's need for such a statistic is acute because its procurement necessarily takes place in an unorganized market environment which lacks the competitive mechanism for establishing an objective price. Owing to this lack of an objective basis for pricing, NASA must engage in price negotiation for contracts awarded. Such a procedure introduces the necessity that NASA include profit margins, i.e., fee payments, as part of the bargaining process. Inclusion of profit margins provides NASA with an indirect link to an organized market that could yield to some extent an objective basis for appraisal of NASA's use of funds.

This linkage involves the influence that NASA contracts could have on the financial health of contract recipients through the impact of these contracts on their cost of capital. Indeed, NASA's denial of contracts to a bidder might have an appreciable influence on his cost of capital also, but this topic is not entertained herein since, a priori, it appears to present considerable statistical complications to add to an already complex question. Undoubtedly it should be explored later on.

This cost of capital question lies behind a standard suggested already for dealing with the profit renegotiations problem.[1] This problem resembles closely the question concerning NASA's potential influence on an enterpriser's financial health. Dissimilarities in these two "problems" are implicit in the discussion below, but one important distinction warrants explicit recognition at this point; profit renegotiation involves an ex post examination of statistics and fact whereas,

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[1]Jacoby, Neil H., and Weston, J. Fred, "Profit Standards for Renegotiation," Procurement and Profit Renegotiation, Weston, ed., (Wadsworth Publishing Company, Inc., San Francisco: 1960), pp. 121-58. Also, Jacoby and Weston, "Profit Standards," Quarterly Journal of Economics, LXVI, (May 1952), pp. 224-50.

in contrast, NASA's contract negotiation places it in the position of assisting in the entrepreneurial decision making -- ex ante view. Despite this seemingly significant difference in the two problems, the profit renegotiation standard evolved by Jacoby and Weston based on the cost of capital concept affords possibilities for utilization on the NASA contract profit negotiation problem. Its adaptation is explored in this paper.

The adapted form of the profit renegotiation standard owing to Jacoby and Weston is labeled the C/A ratio in this study. It is a simple concept that relates a conceptualized quantity called calculated earnings to the actual earnings of a specified period. The calculated earnings are those that ought to exist if a certain standard is to be attained. That standard is based on the feasibility of obtaining equity financing by an enterprise in order to expand its operations. Inherently equity financing involves the cost of capital concept. Moreover, in setting out as a criterion for a good profit standard the requirement that equity financing be a feasible alternative to other financing arrangements, maintenance of capital value is implicit. Finally, the question may be raised as to the propriety of a government agency making use of the cost of capital concept as basis for formulation of policy with respect to fee payment on contract awards.

These questions are given some attention in section II of the paper which discusses the equity financing concept. But as observed therein, the adapted measurement, i.e., the C/A ratio, lacks an absolute interpretation so that an empirical approach involving comparative analysis was required. Findings from the comparisons are presented and discussed in section III. Conclusions and recommendations appear in section IV.

II. The Equity Financing Concept

Essentially the equity financing standard for measuring the adequacy of profits asserts the fundamental propriety of and need for profit rates being sustained at a high enough level to meet two conditions that are necessary in order to assure the continuing operation of an enterprise. First, the rates must provide incentive to assure that the existing equity claimants will maintain their share-claim on the assets on the enterprise. Secondly, whenever expansion is necessary, these rates must be great enough to induce further equity capital contributions from either the present equity claimants or from external sources without eroding the equity-claim status of the present owners of the enterprise. These fundamental features of the equity financing concept, through aggregation of enterprises, may be applied to the industry in which the enterprises classify. It is convenient, however, to continue the discussion of the theoretical aspects of the equity financing concept in terms of the enterprise level, leaving the inclusion of the industry level matters for the empricial portion of the paper.

Viewed differently, it is clear that the equity financing standard evokes the basic principle of a free enterprise economy; if ex post for a period the profits of an enterprise are too low relative to profits generally, then ex ante the next period the owners of the enterprise will attempt to disentangle their equity capital and potential owners will be altered to the fact that they can employ their capital to advantage elsewhere. Giving statistical content to this process is no easy matter: of necessity decisions are made ex ante, but data with which one must work provide ex post measurements of such decisions. Moreover, these ex post measure-

ments are not confined to pure results of the decision makers and the forces of nature combine to exert considerable influence on the outcomes of their decisions.

These observations about the equity financing standard for profit allowance were converted into concrete terms by Jacoby and Weston. /Supra, the first citation./ Their specific contribution was to formulate a procedure that permits the ex post data to be adapted into a statistic that is of some use in drawing inferences about the ex ante decision.

A. Quantifying the Concept

This decision making by both potential and existing owners of an enterprise on whether to engage their free capital or to expand their already engaged capital investment is based in part on objective evidence and in part on subjective judgment of the earning prospects for the enterprise. Doubtlessly some equity capital investors look to a plethora of statistics about the enterprise, as well as other enterprises, in order to infer what the objective evidence indicates; perhaps others use no more than a couple of statistical measurements that suggest the relative earning potential of the enterprise.

Both approaches to decision making are too extreme under most circumstances. Certainly they are too extreme for NASA's interest, and they are too extreme for the profits renegotiation standard in which Jacoby and Weston were interested. An interim position is provided by the equity financing standard which they evolved. It was chosen for examination in this study for the reason that, in essence, it is a simple criterion that makes use of a few strategic economic variables; hence, it is manageable while being relatively informative. It incorporates

elements of both objective and subjective bases for equity investors' decision making.

1. The model. -- Equity capital claimants of an enterprise are influenced in their decision on whether to leave their capital at the disposition of the enterprise by its history of earnings and its history of dividend yields. This knowledge about individuals' decision making is a basis for generalizing a social model for appraising how an enterprise is faring in some year, t. For that matter, a more aggregated model permits a similar inferential process for an industry or any other grouping of enterprises.

The procedure involves comparing the actual earnings in year t with what the earnings would have to be in order to support the enterprise's historical practice on dividend payout from earnings and its average earnings experience. This is tantamount to saying that actual earnings are to be compared with an artifical, hypothesized earnings value. The latter is arrived at by formula and called calculated earnings. The calculation procedure is this: (1) Begin with the residual value of the assets of the enterprise which reflect the aggregate of owner's equity claims, adjusted to current dollar replacement cost. (2) Multiply that value by the average percentage dividend yield for some specified time period, i.e., say the previous decade, to obtain the calculated dividends. (3) Divide the calculated dividends by the average payout ratio of dividends from earnings that has obtained over the same time period in order to obtain the calculated earnings, after taxes, for the year of interest, t.

These three steps are the mechanical reversing of the process by which

yield and payout rates are ascertained initially. Combining and expressing these three steps algebraically, calculated earnings has this formula:

$$C = V\bar{Y}\ \frac{1}{\bar{P}} \qquad (1)$$

with the symbols for the terms meaning:

C - calculated after tax earnings for any specified period, t,

V - value of the assets representing the residual calim of equity investors, adjusted to period t dollars,

$\bar{Y}$ - average percentage dividend yield for the decade terminating at end of any period t,

$\bar{P}$ - average payout ratio of dividends from earnings for period applying to $\bar{Y}$.

Certain other algebraic relationships prove useful in keeping thought straight on the implication of the equity financing principle for a profit standard:

$$\bar{Y} = \sum_{t-9}^{t} Y/10 \qquad (2)$$

$$\bar{P} = \sum_{t-9}^{t} P/10 \qquad (3)$$

$$Y = D/M \qquad (4)$$

$$P = D/A \qquad (5)$$

The additional symbols are for the concepts: D- indicating periodic amount of dividend payments, M - market value of the equity claims, i.e., M $\simeq$ V, and A - actual earnings for any period t.

2. The C/A ratio and its interpretation. -- The comparison of calculated earnings with actual earnings was made by Jacoby and Weston through the mechanism of the rate-of-return. This is achieved by dividing both the C value and the

A value by equity capital invested and then comparing those results.

Following such procedure it can be said that if the rate based on C is greater than that based on A, the earnings in period t are too low compared with their historical level. Direct comparison of C and A permits the same conclusion, however, and indeed they can be compared by placing them together as a ratio. If the ratio, with C in the numerator, stands higher than 1:1, the actual earnings for the period are too low in contrast to the experience over the preceding decade. Moreover, a still more explicit statement about the ratio can be made. If, for example, the C/A ratio stands at 1.5:1 in period t, actual earnings were inadequate by fifty per cent what would have been necessary to support the enterprise's ten-year experience in regard to its dividend payments relative to the level of equity claims on assets, V.

Alternatively the interpretation goes: if the average percentage dividend yield and the average payout ratio were to be adhered to in period t, the dividend payment would include in part a return of capital along with a return on capital. For such an outcome to persist over any extended time period would mean the erosion of the equity capital base.[2]

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[2] This point is not obvious, and so some elaboration is indicated: given that A is falling, period-by-period, but that despite this fact the enterprise desires to maintain Y and P equal to their ten-year averages. (It must be kept in mind that the enterprise can control only the P concept, but it can strive to bring about a particular value of Y.) This means that dividends (= D) fall continually since P is a constant percentage of a continually falling A. But Y is calculated from two elements, D and M. (Formula (4)). Therefore M must fall continually since Y is constant and D is falling. With M falling, even in the face of V (=book value) rising, the price at which any individual can dispose of his capital claim is falling continually, i.e., the equity capital base is eroding. This question is considered in more detail in appendix A.

In the event that the actual after tax earnings were to take on zero or negative values, the C/A ratio would become incalculable or it would become negative. In either circumstance, interpretation of the ratio lacks preciseness, but in such cases its interpretation is unnecessary: a priori the earnings are unsatisfactory.

3. Composition of owners' equity. -- It is apparent from (1) that the makeup of V has an appreciable impact on determination of C. Therefore, deciding the content of V cannot be taken lightly. Nevertheless, for the purpose of this undertaking, deciding on the particular items constituting equity claims on the assets of the enterprise can be disposed of easily. Preferred stock claims on the assets of the companies studied were excluded from the definition of equity claims along with the external claims of conventional classification. This classification appears justified for two reasons: (1) senior securities such as preferred stocks are often regarded as more properly classified along with bonds since they have many features in common, and (2) they occupy, by and large, a relatively small portion of claims on total assets for the companies dealt with herein.

In addition to this deliberate exclusion of preferred stock from equity claims, such items as surplus accounts and capital reserve accounts were treated as though holders of common stocks had exclusive rights to exercise these claims on assets. This is not entirely justified in all instances, but this procedure made the conducting of the study simpler and for that reason was followed. Moreover, the percentage change in equity claims resulting from these classification assumptions was not large.

4. Valuation of assets. -- Most classes of assets used by businessmen turn

frequently enough so that their valuation typically is expressed in current dollars, i.e., their values are not influenced appreciably by the changing value of the dollar. This is not strictly true with respect to inventories, but the extent to which actual value and current year prices of inventories do differ should be unimportant for present purposes.

In contrast to these assets, however, the value of fixed assets as they are conventionally carried on the books often displays a pronounced variation from valuation of these assets in replacement dollars. By far the largest category of fixed assets is the class called depreciable assets, i.e., man made assets. This category is feasible of adjustment to reflect periodic changes in the costs of installing reproducible capital, and that was done in the study. To accomplish this, use was made of a U.S. Department of Commerce study covering the valuation of stocks of manufacturers' depreciable assets.[3] That study makes available the value of stocks of depreciable assets for major manufacturing groups expressed in both historical cost dollars and in 1954 base constant cost dollars. The historical dollar valuation is often called book value; the 1954 dollar cost reflects the approximate cost of replacing an existing stock of depreciable assets at 1954 prices.

After making the adjustment in the valuation of depreciable assets to express their values in current dollars, i.e., the replacement cost dollars for the year of interest, it is concluded that the equity claims total, V, is expressed in

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[3] Huntley, P.R., Capital Assets: The Wellspring for Economic Growth, forthcoming monograph of the Business and Defense Services Administration.)

terms of current dollars.[4]

B. The Cost of Capital

By substituting (4) and (5), properly weighted,[5] into (2) and (3) and then those results into (1), a new expression for C emerges:

$$C = V\left(\sum_{t-9}^{t} D \Big/ \sum_{t-9}^{t} M\right)\left(\sum_{t-9}^{t} A \Big/ \sum_{t-9}^{t} D\right) \qquad (6)$$

which can be reduced still further to:

$$C = V\,(\bar{A}/\bar{M}) \qquad (7)$$

where $\bar{A}$ and $\bar{M}$ have been substituted for the summation of A and the summation of M. And what this reformulation of the definition of C make clear is that it is based on one notion of the cost of capital. One authority, for example, asserts quite positively that there is only one good measurement of the cost of capital concept although one other is reasonably acceptable if used prudently.[6] Professor Solomon uses E_a/P as the appropriate measure of the cost of capital although he finds the E/P ratio marginally acceptable in some situations. His E stands for current earnings, which is nearly the same as $\bar{A}$ used in (7); it lacks the averaging process used here as suggested by the Jacoby-Weston procedure. His E_a stands for anticipated earnings, and P is for the price of a share of common stock. Thus, his P is the same in substance as M of (7) above, for dividing M by the number of shares

4 Some problems in making this monetary valuation adjustment are discussed in appendix B.

5 If (4) and (5) were used as they appear with implicit weights of each year's D/M and D/A ratios being equal, (6) would be: C=V (D/M) (D/A). This form, in addition to weighting the ratios improperly, does not lend itself to the further simplification under discussion nor does it yield a clearcut interpretation of the measurement of the cost of capital concept.

6 Solomon, Ezra, "Measuring A Company's Cost of Capital," Journal of Business (University of Chicago Press, Chicago,: Oct. 1955); reprinted in The Management of Corporate Capital, E. Solomon, ed., (The Free Press of Glencoe, Chicago: 1959), p. 131.

of common stock outstanding would yield Solomon's P.

What the distinction between these cost of capital concepts reduces to is simply this: Jacoby and Weston select a concept that affords statistics, i.e., theirs is an ex post view in which several year's results are averaged in order to eliminate some of the effects of irregularities whereas Solomon settles on the cost of capital concept that is theoretically correct but immeasurable directly. In fact it is in the mind of the entrepreneur. Solomon's approach is ex ante and requires a crystal ball or a forecast of earnings; this point tends to invalidate its use for a profit standard in government contracts, but this inference calls for comment.

C. Propriety of Government Decisions Related to Cost of Capital

Entrepreneurial management of an enterprise is performing its proper function in decision making for the firm when it estimates revenue for the future and translates that revenue into the enterprise's cost of capital, following Solomon, in order to decide whether to seek out the sources of that particular revenue stream. Therefore, the entrepreneur is correct in choosing the E_a/P ratio for such decision making. That is, the entrepreneur bases his decision on cost of capital ex ante.

On the other hand, the government is not responsible for such risk-taking decisions, but rather has the responsibility of insuring that in the long-run there will be resources available to meet its needs. Therefore it needs to avoid the use of the ex ante earnings concept and settle for a good indicator of what has been an acceptable earnings level in the industry in which it will place a contract. Moreover, to the government taking the social view on equity capital, it should make use of V rather than M as the measure of equity capital since V reflects the

summation of inputs existing in the creation of productive capital. Restated, the government -- being NASA in this instance -- should evaluate equity capital through measurement of the inputs that provided it; the entrepreneur should regard equity capital as the market discounted value of future revenues.

D. Significance of the C/A Ratio; Basis of Comparative Analysis

The meaning of the numerical values of the C/A ratio that may be attained is given interpretation above, but it must be acknowledged that the desriable level of the ratio, between 0:1 and 1:1, cannot be expected to persist period after period. Certainly it is a reasonable expectation that this ratio's values will vary through time as do most other statistics on any type variable used for business analysis. Even though values of the statistic were calculated for a decade or more, one would not know what sort of trend to expect nor what might be considered a stable level for the ratio to achieve. The uniqueness of the measurement makes findings on its numerical value difficult of specific interpretation, and consequently resort must be had to some other basis of comparison.[7]

In light of these observations, it would seem, a priori, that an enterprise of interest should have its statistic on the ratio of calculated to actual earnings compared with the same statistic calculated for some appropriate base enterprise or base industry. Moreover, still owing to the uniqueness of the statistic being worked-up herein, one does not know in advance what to expect of such statistic

7. There is an exception to this observation: a priori, for the longrun the ratio must stand below unity and above zero. On the other hand, if a firm could obtain capital consistently through non-equity financing, it might survive in the long-run indefinitely.

for base companies that ought to provide a standard for the comparisons. Therefore it seems desirable to compose a group of "standard" companies to serve as a base of comparison. Choosing these companies is problematic, nevertheless, for one can think of many criteria that the base companies should meet in order to be regarded as appropriate for becoming the base on which to judge the NASA contractor's performance with respect to their C/A ratio values.

Desirable characteristics of the companies of comparison would be that on external grounds for judgment they are known to be (1) financially sound, (2) are experiencing considerable growth in economic activity, and (3) their structural makeup is quite similar to that of the NASA contractors. On the other hand, in considering the last listed characteristic, one can imagine that comparison of the NASA contractors with a base group that exhibits quite dissimilar structural characteristics might be worthwhile -- perhaps more informative than the former case.

The listing of desirable characteristics for companies to be included in the standard companies group for comparison with the group of NASA contractors is quite extendable. Moreover, in virtually no instance can one expect to find companies that have many of these characteristics in common with the NASA contractors. So to include many characteristics as test criteria would require that a considerable number of companies be included in the standard companies group. That was not possible in conducting the current project, of course, so selection of the companies to compose the standard companies group proceeded pragmatically.

All choices were made so that only companies with readily accessible data in conveniently arranged form were included. Some companies were chosen

because it is known a priori that they and/or the industry to which they classify are successful; other companies were selected because they and their industry have long survived in the private, commercial world. Some choices were made to introduce companies that are close alternative users of the same critical resources that are required by NASA contractors. Altogether the companies included for this analysis consist of the NASA group whose activities are almost exclusively aerospace or a closely related type contracting activity, four companies from the automobile industry, three companies in the chemical industry, three companies in the rubber tire industry, and three companies in the stone-clay-glass industry.[8]

This selection of standard companies affords an additional benefit to the analysis. The aggregate group of standard companies can be subdivided into industry groups that can be compared one-by-one with the NASA contractors. Possible advantages from this procedure are patent.

E. Expected Relationship between the C/A Ratio and the Debt-Equity Ratio

The Jacoby-Weston argument, expressed in terms consistent with the C/A ratio used herein, asserts that a C/A ratio of greater than 1:1 predicts the findings of a high debt-equity ratio.[9] Once again, of course, what constitutes a high or a low or a typical numerical level for the debt-equity ratio is relative; it can be evaluated only by comparisons. On the other hand, differing from the C/A ratio, debt-equity ratios have been used in financial analysis for many years, and hence there are some empirically established ideas about what constitutes a high or a low

8 The term industry is used in the broad, nonspecific sense of common parlance rather than according to strict classification by the Standard Industrial Classification Manual published by the Office of Statistical Standards.

9 Jacoby and Weston, op. cit., p. 131.

debt-equity ratio. Nevertheless, it remains true that the level of the ratio for any company tends to fluctuate during the course of major changes in business activities as well as in accord with the net direction resulting from numerous changes in business activities.

Drawing further from the Jacoby-Weston findings, adaptation of their table 9-1[10] gives a C/A ratio of 1.26:1 for the aircraft industry,[11] and accordingly "predicts" a higher debt-equity ratio for aircraft than for manufacturing as a whole. The prediction is realized, for the two debt-equity ratios are: 1.45:1 and 0.48:1. These two authors, two of the most expert in the field of financial economics, discuss the significance of such a relatively high debt-equity ratio. (1:45:1). They observe that a numerical value as high as that of their calculations should concord with an industry characterized by stable, though tending to be low, earnings relative to investment.[12] Such a relationship prevails in the public utility industries. But, they observe further, stable earnings are not the experience of the aircraft companies, and therefore an alternative explanation is required.[13] Lastly, they point out that high debt-equity ratios show up for new firms, especially when entering a developing industry, and for small firms.[14]

The aircraft industry, viz., the NASA contractors' group, was at that time composed of relatively new firms engaging in a new, developing industry, and it

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10 Ibid., p. 129.
11 Aircraft industry as studied by Jacoby and Weston in the mid-1950's has a high degree of concordance with the NASA contractors' group of this study.
12 Jacoby and Weston, op. cit., p. 131.
13 Ibid., p. 133.
14 Ibid., p. 131.

contained many small firms -- none were really large. (At the present, the same statement is substantially true.) Therefore, it is not surprising to note in the findings reported below in section III that the relationship between the C/A ratio for the NASA companies' group and the relative levels of the debt-equity ratios of the NASA group and the standard companies is not far different from the Jacoby-Weston findings.

III. Empirical Findings

This section reports the results of calculating the C/A ratio discussed in Section II. In addition, since Jacoby and Weston stress the significance of their findings on the equity financing statistics in comparison with debt-equity ratios and payout rates, those topics are dealt with herein also. Then the findings are given a summary interpretation.

A. C/A Findings

The ratio of calculated earnings to actual earnings (C/A ratio) is presented in table 1 below for (1) the NASA contractors, (2) the aggregate of standard companies, and (3) separately for each sub-group of standard companies that classify as an industrial activity. The ratios presented are composites for each group, one labeled the simple mean and the other weighted mean. The latter might be regarded alternatively as the aggregate ratio rather than the weighted mean since they are algebraically equivalent.

Deciding which mean to choose for evaluating the status of an "industry" as measured by the C/A ratio is problematic. The simple mean is the arithmetic average of all C/A ratios of the group for which calculation is performed. There-

Table 1. -- Ratio of Calculated Earnings to Actual Earnings for Aggregate of NASA Contractors, Aggregate of Standard Companies, and Aggregates of the Separate Industrial Groups Composing the Standard Companies Group, Ten-Year Periods

Terminating in 1953 and 1963

Company Group[1]	C/A Ratio[2] 1963	1958[a]	1953[a]
NASA Contractors:			
Simple mean[3]	1.23	1.64	1.00
Weighted mean[3]	0.80	1.31	1.05
Aggregate of Standard Companies:			
Simple mean	0.81	1.36	0.71
Weighted mean	0.51	1.13	0.46
Rubber Companies:			
Simple mean	1.46	2.11	1.04
Weighted mean	1.21	1.89	1.03
Chemical Companies:			
Simple mean	0.50	1.51	0.36
Weighted mean	0.31	0.53	0.28
Automobile Companies:			
Simple mean	0.71	1.95	0.57
Weighted mean	0.56	1.42	0.45
Stone-Clay-Glass Companies:			
Simple mean	0.61	0.90	0.88
Weighted mean	0.43	0.83	0.72

1. Companies composing each group can be identified from table 2.

2. C/A ratio discussed in text and formula for C, caluculated earnings provided in (1).

3. Simple mean is the arithmetic average of C/A ratios for companies contained in the aggregation. Weighted mean is the ratio of the summation of the C values for all companies in each aggregation to the summation of the A values in that aggregation. The weighted mean gives the larger companies greater influence on the value of the composite C/A ratio.

a. Group of automobile companies excludes Ford Motor Company for periods prior to 1963 since it was not an open corporation until 1954. This exclusion has no appreciable effect, however, for the C/A ratios in 1963 with Ford excluded are: (1) Simple mean- 0.62 and (2) Weighted mean - 0.40.

Source: Securities and Exchange Commission Form 10-K's, Moody's Industrial Manuals, and Standard and Poor's Corporations.

fore each C/A ratio of the group is treated as equal to all others in terms of importance. In contrast, the weighted mean is the ratio of the summed C values to the summed A values. This is equivalent to stating that each C/A ratio is weighted by the relative size of its A value. Therefore, for an industry dominated by one or two companies, one should expect the weighted mean to agree fairly closely with the C/A value of the largest company -- or two -- while the simple mean would differ appreciably unless all companies of the industry tends to have the same C/A value. That is, if the industry is composed of homogeneous companies, the simple mean and the weighted mean would be nearly the same and would reflect accurately the C/A ratios of all companies in the industry (or group).

This latter result appears only twice: in 1953 for both the NASA contractors and the rubber companies. In both instances the companies were indeed more homogeneous in 1953 than in subsequent years. Perhaps critically, their divergence in homogeneity is manifest in size differences that have developed since 1953. Nevertheless, the rubber companies remain near enough the same size both in terms of total assets and in terms of equity capital so that no one company dominates. Hence, in 1963 the weighted mean of the C/A ratios for these companies more nearly matches the C/A ratio of the middle sized company -- Goodrich.

On the other side of this story, in the automobile and chemical groups one firm exceeds in size the summation of all others included in the groups of this study. This dominance shows up in the C/A composite means. C/A values for General Motors and du Pont appear in table 2 and evidently are close to the values of their respective weighted means of table 1.

Table 2. -- Ratio of Calculated Earnings to Actual Earnings for Individual Companies Composing the Group of NASA Contractors and the Aggregate of Standard Companies, Ten-Year Periods terminating in 1953, 1958, and 1963

Company (Industry Group)	C/A Ratio[1]		
	1963	1958	1953
NASA Contractors:			
Boeing (Aerospace)[2]	1.36	1.61	0.99
United (Aerospace)[3]	1.24	0.99	1.40
North American (Aerospace)	0.71	1.02	0.99
General Dynamics (Aerospace)	0.35	0.99	0.98
Lockheed (Aerospace)[3]	0.43	1.39	1.09
Douglas (Aerospace)[3]	0.74	1.80	0.99
McDonnell (Aerospace)	0.71	1.46	1.88
Northrup (Aerospace)	2.33	1.35	0.34
Republic (Aerospace)	3.60	3.26	0.66
Grumman (Aerospace)	0.83	2.58	0.70
Standard Companies:			
General Motors Corporation (Automobile)[2]	0.38	1.26	0.41
Ford Motor Company (Automobile)	0.99	2.32	a
E.I. du Pont (Chemical)[2]	0.23	0.44	0.25
Union Carbide (Chemical)	0.43	0.55	0.32
Chrysler Motors (Automobile)	0.52	b	0.64
Firestone (Rubber)	0.86	1.59	0.95
Goodrich (Rubber)	1.22	1.46	0.98
Olin-Matheson (Chemical)	0.85	3.55	0.51
United States Rubber (Rubber)	2.28	3.29	1.19
Borg-Warner (Automobile)	0.98	2.28	0.65
Libby-Owen-Ford (Stone, clay, glass)[2]	0.51	0.97	0.71
Corning (Stone, clay, glass)	0.20	0.46	0.48
Anchor-Hocking (Stone, clay, glass)	1.12	1.26	1.46

1. See table 1, footnote 2.
2. Companies ranked within NASA group and within Standard group by size of equity capital claims in 1963. Companies specifically designated by this footnote are largest companies in their own industrial groupings.
3. These companies typically experience between sixty and eighty-nine per cent of their revenue deriving from the Federal Government; all other NASA contractors on this list experience more than ninety per cent of their revenues from government sources. See: Standford Research Institute, The Industry-Government Aerospace Relationship, Vol. II, pp. 90-91.

a. Could not be calculated since Ford Motors was not an open corporation until 1954. Similarly, the 1958 C/A ratio is not based on ten-year yield and payout data as is so for other companies.

b. Could not be calculated meaningfully since Chrysler had a loss in 1958 -- a negative value for A would obtain.

Source: Securities and Exchange Commission, Standard and Poor, and Moody: see source of table 1.

Of much interest is the fact that for almost every pair of measurements the weighted mean is lower. A lower C/A ratio is a more desirable result as concluded in section II, A. 2. Therefore, it can be inferred that those companies that are dominating the industry groups in which they are classified herein are performing better and have performed better for approximately one and a half decades than have the other companies in their groups. It is notable, also, that all industry groups experienced a worsening of the C/A ratio in 1958 and then a substantial improvement in 1963, some in fact improving their position over 1953. With few exceptions, this statement applies to the individual companies as well.

If as implied above, the weighted mean is more meaningful for measuring a group's performance in terms of the behavior of its C/A ratio, it is clear that the 1963 NASA contractors were earning above what their historical patterns would predict. Moreover, the NASA contractors have improved their earnings position relative to the standard companies. Indeed, they have gained on two industries that are main-stays of the economy -- automobiles and chemicals -- albeit these industries still have C/A ratio composites that are appreciably lower than that of the NASA group.

Meriting comment also, perhaps, is the fact that the automobile group, characterized by a demand schedule that is dominated by individual consumers, experienced more pronounced variation in its C/A ratio from 1953-1958-1963 than did the NASA contractors who face one large, sophisticated buyer. The same observation applies to the rubber companies whose demand is in large part a complement of the automobile demand. Moreover, the latter is the only commercial group that does not display a "favorable" C/A ratio. This dispels the possible

hypothesis that industries whose sales are dominated by purchases from individual consumers necessarily fare better by the C/A ratio measurement.

Alternatively, one might be misled into hypothesizing that the C/A ratio is a function of size of companies since the automobile and chemical groups present such low C/A ratios in 1953 and 1963. The stone-clay-glass group, by 1963, compares favorably with those two groups, however, and its companies' sizes approximate those of the smaller aerospace companies. Components of its demand are quite diverse although strongly influenced by individual consumer demand as is automobile demand. But its marketing arrangements are structured quite differently. Perhaps the tentative conclusion can be set forth that the stone-clay-glass companies, being involved in both basic manufacturing operations as well as consumer oriented manufacturing, experience a much more stable demand. Therefore their growth requirements are less --(can be satisfied easily by internal sources) and at once investors in their stocks do not anticipate spectactular gains.

In sum, the statistics of table 1, supported by table 2 for finer interpretations, suggest that in years prior to 1963, the aerospace industry was securing earnings that stood high enough relative to other industries so that the market reflected a high appraisal of the value of equity capital in its companies. That is to say, the market anticipated that earnings would remain relatively high or that they would gain still more. Unless the 1964-66 statistics alter this C/A value, 0.80, it can be concluded that NASA has not done badly by these contractors in its fee payments.

B. Debt-Equity Ratios

The 1953 C/A value in table 1 and the individual C/A ratios of table 2 do

not support quite so dismal a conclusion as that implied in the analysis of Jacoby and Weston with respect to the earnings position of the (then) aircraft industry. Their conclusion, in contrast to the present study, was applicable to the entire industry, and this may have some influence on the differences between their results and those herein.[15] On the other hand, the conclusions emerging from this study cannot be regarded as favorable for the year 1953 either.

They stress that such an undesirable earnings level "predicts" a high debt-equity ratio for the aircraft industry. To inquire further into their conclusion, table 3 was drawn up to provide debt-equity ratios for selective, critical years. Their comparison, 1944-53 average, had the debt-equity ratio of the aircraft industry substantially higher than the ratio for all manufacturing companies. (1.45 -- 0.48:1) Table 3 indicates that such relationships exist for the single year 1953, comparing ten aerospace companies with selected manufacturing companies. The composite, not shown in the table, is 2.06:1 for the aerospace group and 0.87:1 for standard companies. (1.59:1 and 0.70:1 for 1958; 1.46:1 and 0.66:1 in 1963).

Despite this apparent agreement of these findings on the debt-equity ratio with the earlier findings by Jacoby and Weston, too strong and positive conclusions must be guarded against. The significance of debt-equity ratios can be overemphasized, for the debt-equity position of small companies engaging in large contracts is sensitive to variations in the company's earnings. This can be seen in table 3 for General Dynamics. Its 1961 - 1962 debt-equity ratios display such

15 It might be objected that their examination was not actually representative of the entire industry, for as a practical matter they adjusted V, i.e., book value, of all firms by using a ratio of current dollar values to historical dollar values which they obtained from only three large companies.

Table 3. -- Debt-Equity Rations for Individual Companies Composing the Group of NASA Contractors and the Aggregate of Standard Companies, Selected years, 1953-1963

Company[1]	1963	1962	1961	1958	1957	1956	1953
NASA Contractors:							
Boeing	1.50	1.40	1.26	2.00	1.75	1.23	1.82
United	1.18	1.10	1.01	0.69	1.10	1.12	1.30
North American	1.53	1.77	1.45	0.69	1.05	1.56	2.28
General Dynamics	1.91	4.08	9.73	1.37	1.53	2.06	1.96
Lockheed	1.60	2.28	3.03	2.72	2.61	2.43	2.30
Douglas	1.57	1.77	1.74	1.68	1.41	1.33	1.77
McDonnell	1.05	0.79	0.71	2.37	2.84	1.68	1.94
Northrup	1.30	1.03	1.07	1.71	1.83	1.62	2.68
Republic	1.00	1.13	0.85	0.97	0.57	1.11	3.20
Grumman	1.95	1.34	1.29	1.71	0.66	0.75	1.32
Standard Companies:							
General Motors	0.41	0.44	0.44	0.46	0.48	0.53	0.63
Ford Motor Company	0.60	0.58	0.64	0.38	0.45	0.40	..
duPont	0.23	0.20	0.16	0.18	0.20	0.22	0.32
Union Carbide	0.63	0.67	0.70	0.78	0.73	0.80	0.84
Chrysler	1.31	0.98	0.97	0.94	1.04	1.00	0.58
Firestone	0.47	0.45	0.44	0.51	0.69	0.74	0.89
Goodrich	0.46	0.46	0.48	0.40	0.40	0.46	0.94
Ohlin-Matheson	1.08	1.12	1.11	1.24	1.19	0.93	0.97
U.S. Rubber	1.02	0.96	1.44	1.74	1.53	1.96	2.07
Borg-Warner	0.33	0.34	0.49	0.36	0.44	0.49	0.55
Libby-Owen-Ford	0.11	0.11	0.11	0.20	0.23	0.24	0.27
Corning	0.26	0.33	0.37	0.59	0.48	0.55	1.88
Anchor-Hocking	0.32	0.32	0.35	0.43	0.46	0.50	0.62

1. Companies ranked within their espective groups by size of equity capital claims in 1963. More detailed information about companies in footnote 2, table 2.

Source: Calculated from balance sheet data contained on Form 10-K reports to Securities and Exchange Commission.

pronounced differences from its ratios of other years owing to the fact that the company experienced a substantial loss in 1961. This loss reduced appreciably the equity level of General Dynamics. But even in a larger company, losses may result in some variation in debt-equity ratio values; an example in the same table is Chrysler.

These findings attest to the need for exercising caution in the use of debt-equity ratios in analysis of this type. Suggested further is the thought that the debt-equity ratios are too responsive to irregularities that may stem from accounting pecularities to be of any special use.

C. Some Components of the C/A Ratio

Following their debt-equity conclusion, Jacoby and Weston suggest that the higher debt-equity ratio of the aircraft industry may be owing to "excessive" payout ratios. They find that this hypothesis is not confirmed by the statistics, for all manufacturing companies, had a higher payout ratio than did aircraft. This same conclusion holds for the NASA contractors relative to the standard companies; the statistics are given in table 4.

Each of the larger of the standard companies, down through Union Carbide, had higher payout ratios for each year than all NASA contractors almost without exception. The ratio for the other standard companies also tends to be greater than for the aerospace companies. These findings, then, are consistent with those from Jacoby and Weston. So, to the extent that the debt-equity ratios are meaningful as they suggest, the high level in the aerospace industry is not to be accounted for by high payout rates.

Table 4. -- Payout from Actual Earnings and Yield on Market Value of Equity Capital for Individual Companies Composing the Group of NASA Contractors and the Aggregate of Standard Companies, Ten-year Periods terminating in 1953, 1958 and 1963

Company[1]	Payout Ratio (per cent)			Yield (per cent)		
	1963	1958	1953	1963	1958	1953
NASA Contractors:						
Boeing	37.0	23.9	38.3	3.58	5.23	6.99
United	50.8	44.8	43.6	4.44	5.23	6.79
North American	50.0	47.9	46.9	5.02	6.09	7.65
General Dynamics	40.6	53.7	45.9	2.66	4.46	7.04
Lockheed	42.7	38.8	37.7	3.41	5.84	6.21
Douglas	61.3	55.3	57.0	3.28	6.97	8.73
McDonnell	18.9	14.0	15.6	2.17	3.40	5.15
Northrup	23.4	46.6	50.4	4.83	6.41	3.67
Republic	39.4	57.5	25.0	6.34	6.73	4.40
Grumman	56.7	132.4	64.6	5.06	7.60	7.70
Standard Companies:						
General Motors	64.5	61.8	60.5	5.10	7.56	3.78
Ford Motor Company	41.9	60.1	a	4.87	4.55	a
duPont	77.0	74.9	73.1	3.31	4.08	2.39
Union Carbide	70.9	68.9	61.0	3.48	3.53	1.94
Chrysler	43.6	b	54.6	3.45	b	3.31
Firestone	39.2	34.5	30.3	2.88	4.62	3.12
Goodrich	51.8	38.3	29.2	3.17	4.25	3.00
Ohlin-Matheson	52.5	63.8	50.1	3.12	4.16	2.39
U.S. Rubber	40.9	36.3	30.2	4.37	6.76	3.61
Borg-Warner	54.9	52.0	46.0	5.11	7.12	3.46
Libby-Owen-Ford	62.4	64.8	67.7	4.39	5.88	5.99
Corning	52.8	48.9	42.9	1.58	2.53	2.78
Anchor-Hocking	51.1	45.4	44.7	4.25	6.00	5.46

1. For more details about companies see footnote 2, table 2
a. Ford Motors did not become open company until 1954.
b. Loss in 1958.

Source: Standards and Poor's and Moody's.

Another point to consider which Jacoby and Weston did not delve into explicity is the conclusion to be drawn from another component of the C value, i.e., yield -- $\bar{Y}$. Jacoby and Weston imply that yield in the aircraft industry from 1953 forward would fare poorly in comparison with yield for other enterprises. Table 4 confirms this "prediction", for it is apparent that the NASA contractors' yield stood high in 1953 and then fell progressively in the later periods, and, in contrast, the standard companies tended to reverse this behavior. In fact, the group average yields behaved this way:

	1953	1958	1963
NASA contractors	6.63	5.63	3.98
Standard companies	2.99	5.00	4.01

From this it can be seen that the aerospace companies worsened their position, relatively, but that it remains at a favorable level measured in terms of yield positions of other enterprises.

Still there is one more point to observe in this content: yield in table 4 is given by the formula $\bar{Y} = \Sigma D / \Sigma M$ for a ten year period. Therefore, if earnings tend to be relatively high for an industry for a time and/or other bases for believing they will remain high are apparent, then the market will bid up M so that $\bar{Y}$ may decline. This can be viewed as the market dissipation of an industry's success. For this reason the yield figures at any one time point are not especially meaningful for evaluating an industry's performance nor perhaps for predicting its future. But one might surmise this same point from the algebra of the calculated earnings: $C = V\bar{Y}1/\bar{P}$ which becomes $C = V\Sigma D/\Sigma M \quad A/\Sigma D$ which

reduces to $C = V\Sigma A/\Sigma M$. In the final expression, yield vanishes as such.

D. Summary of Interpretations

The weighted mean of the C/A ratios for an industry reflects best how the industry is faring in terms of earnings, A, that materialize in a specific year compared with earnings for that year that can be calculated as consistent with (1) its past earnings experience, (2) its payout practice, (3) the market response to both earnings and payout, and (4) the explicit equity investment, V. By this measure, the NASA contractors were faring well in 1963.

Debt-equity ratios are shown to be possibly misleading when used to make inference about underlying causes affecting the company or industry. If a company is small such as the aerospace companies are but is doing business on a large scale, a loss can have considerable impact on its equity position,whereas a large company such as General Motors could absorb a large loss without its equity capital being disturbed appreciably. Therefore one cannot infer much from the debt-equity ratio without examining several other statistics at the same time.

It is concluded, consistently with Jacoby and Weston, that the high debt-equity ratio of aerospace is not to be accounted for by greater than average payout rates.

Lastly, the yield on market value of equity claims for aerospace companies is observed to have declined from a higher than average level to about average, as compared with standard companies selected for comparison in the study, by 1963.

IV. Conclusions and Recommendations

The equity financing standard for profits allowance developed by Jacoby and Weston for renegotiation purposes has a strong intuitive appeal. Based on that standard, they worked out a formula for calculating a synthetic rate of return on equity capital which they infer is an appropriate rate from the social viewpoint.

This study makes use of the same concept, an equity finance based standard, but it adapts their formula to obtain what is called a C/A ratio. This ratio, of itself, compares the earnings calculated by the equity financing standard formula with actual earnings. The adapted form was for the purpose of obtaining a measure that would yield fairly definitive answers and yet retain simplicity in its interpretation. The C/A ratio commends itself on these requirements, and yet, since it omits a step in calculation that the Jacoby-Weston standard includes, can address only the question of how well companies have done; it is purely an ex post measurement. On the other hand, the Jacoby-Weston standard is expressed as a rate of return on equity capital, and therefore it is adaptable to dealing with decision problems. The rate of return -- calculated not actual -- of an industry can be used in negotiation of an appropriate profit margin.

This measure, since it rests upon the cost of equity capital measurement, is a measure of the market's appraisal of the industry's earning potential. It provides a basis for evaluating the risk of a particular industry, and hence what return it could expect to receive in addition to repayment of its explicit costs.

It is necessary to keep in mind the significance of the question of whether calculated earnings should be based on book value or market value of equity capital. That is, should the formula be as presented in (1):

$$C = V\bar{Y}\ 1/\bar{P}$$

or of the form:

$$C = M\bar{Y}\quad 1/\bar{P}$$

The argument in section II follows Jacoby and Weston in support of the former expression. This position is contended by the writer as more appropriate since book value of assets reflected the explicit costs of inputs that make up the productive capacity against which equity capital has a claim. In contrast, market value of the equity capital, M, introduces a speculative element that changes periodically and may at times be far at variance from the true potential output of the assets on which equity capital has claim.

Comparison of the C/A findings with other sections of this report is desirable also. The conception is similar to the z(t) of Part II; this similarity can be seen in the following. The C/A is, approximately,

$$\left[\frac{\sum_{1}^{10} E_i}{\sum_{1}^{10} MV_i}\right] \Big/ \left[\frac{E_i}{BV_i}\right]$$

The z(t) ratio used in Part II is

$$\left[\frac{E(t)}{MV(t)} + b\right] \Big/ \left[\frac{E(t)}{BV(t)} + b\right]$$

Both are expressions of an average earnings-price ratio divided by an earnings-book value ratio. Since the methods of measuring are different one expects some difference and some similarities in the final measures. In Part II, z(t) = 80 for the aerospace firms which accords with the weighted C/A value in Table 1 herein. Similarly, z(t) for automobiles and chemicals is fairly close to the ten year C/A for 1965 -- 0.56 and 0.31.

These comparisons are similarly favorable for these three industries in 1953 (or 1954), but there is much divergence in 1958. This suggests that the C/A ratio is more sensitive than one would imagine an average to be. The behavior of the rubber companies stand out in contrast. For it the level of **z** is much below the level of the C/A ratio, but the direction of change is that same for both measures -- rising.

One can examine the C/A ratios of table 2 and see why a favorable level of the cost of capital obtains in 1963 for aerospace --North American's C/A is well below the critical 1:1 level and two other large companies, General Dynamics and Lockheed, exhibit C/A ratios that compare favorably with the C/A of the chemical industry. At once it can be seen that the aerospace industry easily could experience an unfavorable change in its cost of capital, for two large companies -- Boeing and United -- exhibit C/A ratios much above the critical 1:1 level in 1963. And, oddly, the C/A ratio records favorably for only one rubber company -- Firestone, although in 1953 Goodrich was slightly below the critical 1:1 level.

This last observation is a reminder of conclusions reached in the discussion of the empirical findings, sub-section III, A. Restatement may be appropriate: automobile and rubber companies are noted to have experienced more pronounced variation in the C/A ratio during 1953-1958-1963 than did the aerospace companies -- NASA contractors, but on the average the C/A ratios for the automobile industry is much more favorable than it is for the aerospace industry. In contrast, the C/A ratio for aerospace records a more favorable situation than it does for the rubber industry. The conclusion is suggested from this that the nature of the demand for the product does not account for the tendency of the cost of

capital in aerospace to run high.

Moreover, the C/A findings for 1963 suggest that the cost of capital for aerospace companies is decreasing, perhaps reflecting the market appraisal of its risk being consistent with that of typical, moderately successful enterprises doing exclusively commercial business. This point should be affirmed or negated by C/A findings for 1964 and 1965.

Finally, to reiterate and summarize conclusions contained in the discussion of findings in subsection III, B and C, the C/A ratio is a more meaningful statistic than is the widely used debt-equity ratio since the latter can misdirect the hypothesizing. It requires other statistics to insure against erroneous inference, e.g. concluding that high debt-equity ratio is attributable to a high payout rate. That conclusion does not apply to aerospace companies although one might have been prompted to think so in 1953 since the aerospace industry was experiencing a high yield on equity capital investment.

Appendix A

Observations in the main text with respect to interpretations to be placed on values of the C/A ratio necessarily are set forth assertatively. Detailed examination of it as a mechanism would detract from the central discussion. Those assertions are supported here.

A. Identification of Algebraic Relationships

To begin the argument, consider the C/A ratio itself: it is by definition the relationship between two concepts of corporate earnings. The C value is total calculated earnings for a period, i.e., an artificial value given by formula. The

A value stands for actual after tax earnings. In performing the calculation for defining the C value, several variables are required.

V - recorded book value of equity claims on assets of the corporation.

M - value of equity claims expressed in common stock prices,

Y - yield of earnings measured against market value of equity claims,

D - dividend value, i.e., amount actual paid stockholders from earnings,

P - payout ratio of dividends from actual earnings,

A - actual earnings (more completely defined above),

C - calculated earnings defined above.

From these variables it is useful to develop several algebraic expressions of definitional or behavior relationships among them. Appearing first is the primary definitional relationship of these variables to calculated earnings, and following that are extensions of terms contained in the first equation. The definitional equation states that the calculated earnings should be large enough to support equity claims' valuation at a level consistent with continuance of the average payout ratio and continuance of the average yield percentage:

$$C_t = V_t \bar{Y}_t \div \bar{P}_t \qquad (1)$$

The average yield $\bar{Y}$ can be taken for a decade or for some other period of time. The decade is selected herein following the example of Jacoby and Weston. Therefore, $\bar{Y}$ and concomitantly $\bar{P}$ are averages of the yield percentage and the

payout rate respectively for the ten-year period terminating with year t:[1]

$$\bar{Y} = \sum_{t-9}^{t} Y \div 10 \qquad (2)$$

$$\bar{P}_t = \sum_{t-9}^{t} P \div 10 \qquad (3)$$

The components of (2) and (3), taken from the definitions of the variables above, are:

$$Y = D/M \qquad (4)$$

$$P = D/A \qquad (5)$$

Therefore (2) and (3) can be reformulated as:

$$\bar{Y}_t = \sum_{t-9}^{t} D / \sum_{t-9}^{t} M \qquad (6)$$

$$\bar{P}_t = \sum_{t-9}^{t} D / \sum_{t-9}^{t} A \qquad (7)$$

The denominator ten appearing in both (2) and (3) is excluded from (6) and (7), even though in theory it belongs in them, since it cancels out. But it can be

1 Since two of the basic variables, i.e., V and M, are claims on stocks and two others, C and A, are flow items, there is a notation problem with respect to the period t. For the flow items the t must stand for values accumulating during the period t, but the stock items could be identified with the beginning, the middle, the end; or some other point of time within the year t. For present purposes, it is desirable to designate V_t to be the value at the beginning of the period. It follows that M_t should be the value at the end of the period since it is the market appraisal of V_t. Such appraisal depends on the actual earnings realized during the period, A, and the dividends, D, generated from V, and consequently it is logically a lagged variable. The exact period of lag may in practice differ from the nearly full year established here, but the algebra is more conveniently handled by this assumption and the principle is unchanged on that account.

seen that (1) contains terms composed of (6) and (7) so that it can be reformulated:

$$C_t = V_t \sum_{t-9}^{t} A / \sum_{t-9}^{t} M \qquad (8)$$

Once more an element, D in this case, is excluded since it would cancel out in the algebraic manipulation. An from (8) a useful version of the C/A ratio emerges:

$$C_t/A_t = V_t/A_t \sum_{t-9}^{t} A / \sum_{t-9}^{t} M \qquad (9)$$

In (9) it is apparent that not only is the C/A ratio sensitive to what value materializes for A in year t but that on the right hand of the equation, A_t affects both the denominator and the numerator. The effects are not necessarily neutralizing, however, and so it is instructive to construct models containing predetermined conditions in order to analyze the impact of alterations in the value of A.

B. Numerical Content of the Model

A desirable first condition of the model is that the growth rate for V be set at eight per cent since that tends to be the average rate at which both the typical NASA contractor and the typical standard company grew for the period 1954-1963. For convenience in developing the model it is desirable also to stipulate that period-by-period V = M and that the eight per cent growth rate be continual rather than a decade average. (It must be borne in mind that V_t is a beginning year value and that M_t in a year ending value.) Lastly, it is cumbersome to use a model in which P varies year-to-year, and so it is set at fifty per cent.

Having set forth these initial conditions of the model, certain others follow: (a) M must grow at eight per cent since M (=V) does by assumption, (b) A - D = D as a consequence of the fifty per cent assumption for P, (c) A - D grows at eight per cent since $A_t\text{-}1\text{-}D_t\text{-}1 = V_t$, i.e., A - D of a period is the contribution to growth in V of the next period, and V is growing by eight per cent by initial assumption,[2] (d) combining (b) and (c) leads to conclusion that A and D are growing at eight per cent and similarly their summations, $\sum A$ and $\sum D$ grow at this rate, and (e) since both A and $\sum A$ grow at eight per cent and M_t and $\sum M_t$ do also, the ratio A_t/M_t is equivalent of the ratio contained in (9) -- $\sum_{t-9}^{t} A / \sum_{t-9}^{t} M$.

The last relationship expressed in (e) permits the development of one more equation that is unique to the conditions assumed:

$$C_t/A_t = V_t/M_t \qquad (10)$$

In this unique case the C/A ratio is unity because V = M by initial assumption. This forms the basis for inquiring into the question of the significance of a non-unitary C/A ratio such as appear in the empirical work.

To accomplish this objective, it is helpful to quantify formula (9). It can be done conveniently by merely assuming a value, e.g., 1,000,000 for V_t. Then the other terms are determined:

$$C_t/A_t = 1,000,000/A_t \cdot \sum_{t-9}^{t} A / \sum_{t-9}^{t} M$$

2 This relationship may appear puzzling. It can be illustrated: if V at beginning period is 10,000 and V at end of period is 10,800 then the 800 difference is an eight per cent increase over $V_t\text{-}1$, but 800 is also ΔV which identifies with the terminal value, V_t.

Since M = V, the M_t term is 1,000,000, and it follows that the first component of the summation series, i.e., M_{t-9}, is 500, 249.[3] Interim terms of the summation series are sequentially eight per cent greater, one to the next. These sum to 7,246,894, giving now:

$$C_t/A_t = 1,000,000/A_t \cdot \sum_{t-9}^{t} A/7,246,894$$

Next, A_t and C_t ($=A_t$) can be determined. They are equal to twice the expression ($A_t - D_t$) owing to P being set at 0.5. And $A_t - D_t$ equals eight per cent of V_t, i.e., equals ΔV so A_t equals sixteen per cent of V_t, and this provides the remaining numerical content of the expression save for the summation of A:

$$160,000/160,000 = 1,000,000/160,000 \cdot \sum_{t-1}^{t} A/7,246,894$$

But of course it can be solved for at this point and is found to be 1,159,503. Alternatively it could be obtained in the same way as was the summation of M. (See footnote 3)

C. Responses to Decline in Actual Earnings

Now it can be supposed that the condition $A_t = 160,000$ does not materialize, but instead it falls to 80,000. This outcome disequilibrates the numerical content of (9), but there are several possibilities for restoring the balance: (1) Management may elect to make the same D payment that would have been forthcoming had A attained its anticipated value, 160,000; i.e., change P from 0.5 to 1.0 for this year. Perhaps they imagine that such action would circumvent a market

3 The first in the series of ten summation terms, growing at eight per cent, results from dividing 1,000,000 by 1,9990046. This denominator derives from expansion of the expression for growth, $(1 + r)^n$, to the n = 9th term with r = 0.08.

(8) unchanged.

(2) Management alterntively may feel compelled on technical grounds to maintain the eight per cent growth of V thereby reducing the P ratio for this year from 0.5 to zero. Both these decisions by management could result in a range of adjustment possibilities on the part of the market appraisal of V. The extreme possibilities call for attention.

Suppose that following action (1) management is proved correct in its judgment, and that it was able to obviate a market response to decline in A. This means that the market continues its evaluation of M = V owing to the continuance of the eight per cent growth in D, and equation (8) content becomes:

$$C_t = 1,000,000 \cdot (1,159,503 - 80,000)/7,246,894 = 1,079,503,000,$$

000/7,246,894

and the C/A ratio stands at 1.862:1.

Alternatively, and indeed more likely, management may be wrong in its judgment of the market reaction to a fall in earnings accompanied by the continuance of anticipated dividend payments, for equity claimants and potential equity claimants are influenced by the value of the assets in the enterprise which they can claim as well as by the amounts of dividends they receive. Therefore, it is possible that market reaction to management's execution of action (1) would result in the deflation of M_t and consequently affect a reduction in the summation of M. It is not likely that M_t would fall to fifty per cent of V_t based on this one time deviation of A_t from its decade trend, but perhaps a decline of ten per cent would not be far off. Hence,

$$C_t = 1,000,000 \cdot 1,079,503/(7,246,894 - 1,000,000)$$

$$= 151,045$$

and the C/A ratio stands still higher than in the former case, being 1.888: 1.

Implicit in the above examination is the fact that if the C/A ratios were to hold constant at the 1:1 relationship despite the fall in earnings, A, the term $\sum_{t-9}^{t} M$ must rise appreciably. Since all M values in the summation are fixed except M_t, it would have to absorb the entire adjustment in this case. Following through on the first case with this additional assumption: the C_t/A_t ratio continues to be unity, but its numerical calculation changes from $C_t/A_t = 160,000/160,000$ to $C_t/A_t = 80,000$. In (8) then the results are:

$$C_t = V_t \cdot \sum_{t-9}^{t} A / \sum_{t-9}^{t} M$$

$$80,000 = 1,000,000 \cdot (1,159,503 - 80,000) / \sum_{t-9}^{t} M$$

$$\sum_{t-9}^{t} M = (1,000,000 \cdot 1,079,503)/80,000 = 13,493,788$$

(Some other details of the adjustment procedure may be helpful. The summation A term is reduced by 80,000 because A_t, its last component is reduced from 160,000 to 80,000 by assumption. This requires the summation M term to change from 7,246,894 to 13,493,788 in order to maintain the equilibrium with $C_t/A_t = 1$. It would need to double exactly to maintain equilibrium except that the summation A term falls by 80,000. The composition of the summation M term changes in this way: when $A_t = 160,000$, $\sum_{t-9}^{t.1} M_t$ is composed of the series M_{t-9}, M_t-8, . . . M_t with $M_t = 1,000,000$. Therefore $\sum_{t-9}^{t-1} M_t$ is equal to

7,246,894 - 1,000,000, i.e., 6,246,894. But when A_t = 80,000, the first nine elements of the summation M term remain unchanged, and therefore M_t becomes 13,493,788 - 6,246,894, i.e., M_t = 7,246,894.)

The conclusion emerges: if the C/A ratio is to remain unity with a halving of A_t, M_t must increase manyfold. How much M_t must increase is a function of both the growth rate and the length of time chosen for the summation period -- it can be different than the ten-year period selected herein. A second conclusion is patent: if the C/A ratio were to fall with a fall in A_t, then M_t value would have to rise by an even greater amount. Since it is most unlikely that M_t would rise in association with a fall in A_t, it can be concluded that the C/A ratio changes inversely to a pronounced change in A_t.

There is a final possibility not considered above. V_t remains unchanged no matter the other alterations in assumptions and other terms. It was handled this way for the simple reason that the model has no provision for changing V since it is the book value which by accounting convention is not changed. Therefore it is unaffected by changes in A_t. Nevertheless, the real value of V_t can change as the price of capital assets changes, i.e., inflation could raise the real value of V_t while its stipulated value is unchanged. Since actual and potential equity owners consider this point in making their investment decisions, in the main text the C/A ratios were calculated after V was adjusted to reflect rising prices. It is necessary to consider how that fact modifies the above argument.

D. Result: Equity Capital Erosion

In the first two cases, the C/A ratio rose to 1.862:1 and 1.888:1. In both

situations, if V_t were raised above the 1,000,000 by a price index, the C/A ratio values would be even greater than those found. In the third case, the C/A ratio was held constant by assumption and the M_t term had to absorb the entire adjustment reaction. If V_t were greater, then the adjustment requirement imposed on M_t would be greater, and since it was concluded that such adjustment is virtually nil in the real world, it would appear even less likely with V_t greater.

Since the latter case is unrealistic, the former two cases must be representative of the directional reactions of the market, measures in C/A values, to pronounced reductions in earnings from their growth trends. In sum, they imply that high and/or rising C/A ratios reflect the market's downward reappraisal of equity claims based on relative decline in earnings. Therefore, in two senses there is apparent erosion of the capital base associated with high C/A ratios. One, market appraisal reflects a composite judgment of the present value of the stream of earnings expected to be associated with equity claims on assets. It is an unmaterialized valuation of equity claims, and as such it is an estimate of what ultimately will materialize if earnings do not improve in the meantime. Secondly, to the extent that this enterprise is experiencing earning rates less than those of other enterprises in which equity claimants could have elected to make their equity investment, opportunity losses are absorbed by these owners and accordingly their equity capital is eroded.

E. No Growth Condition

Discussion above deals with a model involving growth in equity claims. It is a model in which it is assumed that all increases in equity are internally generated,

and hence this is genuine growth, the source of which is entirely from earnings. Therefore, for growth in equity to come about, there must be either growth in earnings or alternatively a continual decline in payout. The latter condition, of course, could not persist indefinitely, and this prompts the possibility of a no-growth-in-equity situation.

The no-equity-growth circumstance could exist indefinitely with rising or falling earnings so long as they did not fall below zero. A model for this warrants consideration. Implicit to the model is the condition that the payout ratio (P) is always unity. Anither condition that makes the model more manageable for analytical purposes is that initially the earnings (A) be assumed constant. It follows that the model has several other constants: V, $\bar{A}$ (=A), $\bar{D}$ (=D), and $\bar{P}$ (=P). The term $\sum M$ remains free to vary since M_t can vary, and consequently $\underline{C}$ may vary, and of course on the basis of conclusions reached in section C it will move inversely with variations in M_t.

If the model is constructed on the assumption that in periods prior to t the relationship M = V held, the $\sum M = 10V$, and a further equation of some use may be presented:

$$C/A = V/A \cdot \sum A/10V \qquad (11)$$

Since the term $\sum A$ is equal to 10A because A is constant, then (11) can be expressed in variant form and solved:

$C/A = V/A \cdot \bar{A}/V$, but since $A = \bar{A}$, this becomes $C/A = V/A \cdot A/V = 1$

A/V

$=1$

In the event that the price of capital is rising, however, V does not hold constant in real terms and the C/A ratio rises accordingly. Alternatively, if A remains constant and V in real terms does also, then M may rise or fall, depending entirely on what other enterprises are experiencing in their earnings, growth, etc. It follows that if A rises with V constant in real terms, D must rise; so surely would M. In the latter case, M may or may not rise enough to maintain proportionality in the ratio $A/\Sigma M$, and so the directional responses of the C/A ratio cannot be predicted without supplementary statistics.

Appendix B

Depreciable assets compose a large portion of total assets on which owners' of an enterprise exert their equity claims. These assets accumulate into property accounts over several years, and the prices at which each asset enters the account is recorded at its initial cost (or value). This valuation of an asset remains intact on the books of account unadjusted, with rare exceptions, until the asset's life expires. Through the years that the asset is available for use its replacement cost changes -- typically upward during the past two decades -- and so its book value, also called historical value, differs from its current value at replacement cost.

The equity capital concept (V) was adjusted in this study to take account of this growing divergence between book value and replacement value. This was accomplished, as cited in textual discussion, [16] by use of ratios relating replacement cost to historical cost. The companies' depreciable assets were simply inflated by that ratio, one which applied in 1953, another for 1958, and a third for 1963.

One problem persists, however, for properly the replacement cost of assets does not change uniformly among the industries. The study from which the ratios were calculated does not have the industrial detail that is desirable. For example, aerospace and automobile companies were adjusted by the same ratio since they both classify in the two-digit manufacturing industrial group -- transportation equipment, SIC 37. Undoubtedly the life cycle of aerospace assets differs from that of automobile manufacturers and similarly their capital replacement costs changed at different rates through the years. Therefore there is some element of bias in this procedure.

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16 Supra, fn 3.

The same point could be made for each of the other manufacturing groups: it would be desirable to have a finer industrial breakdown for this adjustment of assets' values. On the other hand, it also true that the companies do not in all cases conform well to the industrial group in which they classify even at the two-digit level of the SIC code -- they are too much of conglomerates. So this is another problem that could not be dealt with -- merely recognized.

A final problem involves the index of capital assets' prices that was used in the study upon which this one drew. It is the common index problem about which the literature speaks often, but which involves such huge undertakings to improve on that not even the U.S. Government has made more than a token effort to deal with it. Simply put, there is not enough information and data on the prices of different capital assets, and therefore any price adjustment remains rather gross.

A Review of Economic Profit Theories

There is no general agreement among economists regarding the definition of profit beyond that it is, in fact, a conceptually difficult problem. We cannot say for profit, as has been said for wages, the return to labor; interest, the return to capital; and rent, the return to land, that it is clearly a functional return for some specific action performed within the economy.

The most simple definition of profit is that it is the residual left after paying all costs; if all costs cannot be met there exists a negative profit. The above is in the context of pure profits; that is, it must be residual and not part of the other functional returns (wages, interests and rent). Profits are temporary phenomena, arising because there are imperfections in the economic system. "For a thousand reasons the economic organism does not function quite properly. Error, mishap, indolence, and so forth become, in the well known manner, a continual source of loss, but also of profit."[1] If the system were perfectly competitive (both in the factor market and in the producer's market), there would be no profit. In a purely competitive system what is considered as a "fair return" to the producer is included in the cost curve (fair in the sense of inducing the firm to remain in a given industry). In terms of general practicality, it is necessary to account for the rationale for making payments of profit to the firm.

Various theories have been advanced in an effort to explain from whence this residual arises; they are as a payment of windfall or gratuity, as a result of gaining

1 Schumpeter, Joseph A., The Theory of Economic Development, Harvard University Press, Cambridge, Mass., 1955, p. 32.

a monopolistic position in the market, for the undertaking of ventures involving risk, and for enterpreneurial innovations. These theories fall into two branches of though; those theories which are nonfunctional, i.e., monopolistic position or windfall gratuities, and those which are functional, i.e., risk bearing and innovational theories.

The theory of profit return stemming from a monopolistic position in the market is very basic. The firm need only be the first in the market or hold some exclusive right to a particular product, e.g., a patent or trademark. It arises as a result of singleness of position. (This is true analytically due to the nature of the demand curve faced by the firm under these conditions, downward sloping to the right as opposed to perfectly horizontal under conditions of pure competition.) This type of profit can be competed away by other firms. The ease or difficulty of so doing depends upon the strength of the consumer's preference for the product and the ease of producing a substitute good.

The windfall profit "... may be defined loosely as unanticipated changes in the value of property relative to other real goods."[2] Thus it is part of the dynamic nature of the economy.[3] "Any favorable change in economic conditions not generally foreseen and allowed for in advance brings a temporary profit,"[4] and such profits are commonly a result of forces beyond the control of the producer. In

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2 Dean, Joel, Managerial Economics, Prentice Hall, Inc., Englewood Cliffs, N.J., 1964, p. 18.

3 Not in the sense of dynamic referring to mere changes, but because the nature of the changes are unpredictable. Profits can arise in a static or stationary state if imperfections are allowed for within it.

4 Abbott, Lawrence, Economics and the Modern World, Harcourt Brace, & Co., New York, 1960, p. 674.

economic terminology, these forces are called exogenous variables; that is, they are held as constants, outside the economic system under analysis, e.g., war, population changes, changes in technology, and changes in the general price level. When these forces act in a benevolent manner to the producer, he will experience a windfall profit (in the opposite case he will, of course, experience a windfall loss).

The fundamental idea behind the risk theory is that in order to induce a producer to undertake the risks involved with production, i.e., risks of ownership and the holding of non-liquid assets, he must receive some sort of reward, profit. There is risk in every action the producer makes in the sense that dealing with the future entails uncertainty. This is a dynamic aspect of the economy. It is a major consideration since once the initial risks have been run, his return could be reduced to correspond to the risks remaining to be run. Risk can also work in favor of the producer since it tends to act as a barrier to others wishing to enter the field.

Restrictions can be made upon the amount of risk the producer undertakes. Risk in the ordinary meaning of the word is "measurable where anticipation may be guided by statistical probability. Uncertainty is restricted to cases of the non-quantitative type."[5] Calculable risks can be covered by insurance, those which are incalculable cannot. Incalculable risks are compounded by their uncertain nature.

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5 Weston, J. Fred, "A Generalized Uncertainty Theory of Profit," American Economic Review, March 1950.

Frank H. Knight, the chief protagnoist of the risk theory of profit, categorizes risk into the aforementioned types, believing that the profit return is a result of the uncertainty type of risk.

> The normal economic situation is of this character: The adventurer has an opinion as to the outcome, within more or less narrow limits. If he is inclined to make the venture, this opinion is either an expectation of a certain definite gain or a belief in the real probability of a larger one. Outside the limits of the anticipation any other result becomes more and more improbable in his mind as the amount thought of diverges either way. Hence it is correct to treat all instances of economic uncertainty as cases of choice between a smaller reward more confidently and a larger one less confidently anticipated. 6

Schumpeter, in his development of a theory of profits as a result of entrepreneurial innovations, discusses the problem of risk at some length. Basically, he agrees with the uncertainty theory of risk, but he does not attribute the main source of profit to it.

> Two kinds of risk may be distinguished, the risk of technical failure of production, in which we can include the danger of loss from acts of God, and the risk of commercial failure ... Businessmen will take account of - and equalize- the difference in risk between the branches of production by simply avoiding the more risky branches until the consequent increase of prices in the latter offers a compensation. None of these methods of evening out economic risks, in principle, creates a profit ... The matter is different of course, if the risks are not foreseen or at any rate are not taken account of in the economic plan. They then become on the one hand sources of temporary loss and on the other hand sources of temporary gains. 7

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6 Knight, Frank H., Risk, Uncertainty and Profit, Houghton Mifflin Company, New York, 1921, p. 237.

7 Op. Cit., Schumpeter, pp. 22-3.

A profit which is a return due to entrepreneurial innovations is a result of the entrepreneurs carrying out new combinations with existing resources. "The carrying out of new combinations means ... simply the different employment of the economic system's existing supplies of production."[8] Entrepreneurial profit, then is ... "the surplus, to which no liabilities correspond...."[9]

The entrepreneur is the motivating force behind the introduction of the innovation. Entrepreneur, a word of french origin, was first used to describe the businessman who undertook the entire burden of his business; financing, organizing, and bearing all of the risk involved. The modern business entity, the corporation, is characterized by a separation of ownership and management. This has caused some confusion regarding identification of the entrepreneur since there is not an easily identifiable person who fulfills the original definition (with the possible exception of Howard Hughes). This problem is confronted by Schumpeter who rationalized that:

> ... it is not essential to the matter though it may happen - that the new combination should be carried out by the same people who control the productive or commercial progress which is to be displaced by the new ....[10]

A succinct summarization of this can be made by saying that he means command over the means of production as being necessary to the carrying out of new combinations but not actual ownership or the bearing of risk. He states further that:

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8 Ibid, p. 66
9 Ibid, p. 132
10 Ibid, p. 66

> Risk obviously always falls on the owner of the means of production or of money capital which was paid for them, hence, never on the entrepreneur as such. [11]
>
> .... even if the entrepreneur finances himself out of former profits or if he contributes the means of production belonging to his "static" business, the risk falls on him as capitalist or as professor of goods, not as entrepreneur ... Even though he may risk his reputation, the direct economic responsibility of failure never falls on him. [12]

The entrepreneur, then, is someone who carries out innovation. This person could be a shareholder, member of the board of directors or part of the management. Whether he is any or all of these people, he is only considered as an entrepreneur when he carries out new combinations. An approximation of fulfilling the original meaning of the word entrepreneur would occur if management or a member of the board of directors is also a shareholder and performs as an entrepreneur, because he would fill the requirements of financing, bearing risk, and organizing. (The question of management or member of the board of directors is quite interesting. In this capacity one would be in the position to take advantage of the lucrative opportunities of stock options offered by the company. They could, therefore, amass a sizeable amount of stock in the firm over a period of time. Their interest in the firm as owner-risk bearer would therefore be heightened.) In its usual capacity management is considered as being a high-level supervisory task. It is, as previously mentioned, only when one of these men carries out innovation that he is considered to be an entrepreneur, and once the innovation has been

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11 Ibid, p. 75.
12 Ibid, p. 137

introduced it becomes datum and he again assumes the role of management. Clearly, the entrepreneur must be identified by his active role in the firm rather than his position with it.

> The carrying out of new combinations we call "enterprise;" the individuals whose function it is to carry them out we call "entrepreneurs" ... in the first place we call entrepreneurs not only those "independent" businessmen in an exchange economy who are usually so designated, but all who actually fulfill the function by which we define the concept, even if they are, as is becoming the rule, "dependent" employees of a corporation, like managers, members of boards of directors and so forth, or even if their actual power to perform the entrepreneruial function has any other foundations, such as control of a majority of shares ... it does not include all heads of firms or managers or industrialists who merely may operate an established business, but only those who actually perform that function.
>
> Therefore we have distinguished between entrepreneurs and capitalists irrespective of whether the latter are regarded as owners of money, claims to money, or material goods ... It also settles the question whether the ordinary shareholder as such is an entrepreneur and disposes of the entrepreneur as the risk bearer.[13]

The entrepreneur as a leader emerges when opportunities come before him. He does not have to actively seek them out. Possibilities are all around him, being gathered by all sorts or people - it is his function to combine them and put them through. (Thus to invent is not necessarily to be a leader, for to qualify as a leader the invention must be carried through). He must have the insight into the problem at hand and catch the imagination of others, he must compete existing resources from their present use and free them for his own use in the new

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13 Ibid, p. 74

combination.

> . . . the carrying out of new combinations is a special function, and the privilege of a type of people who are much less numerous than all those who have the "objective" possibility of doing it. Therefore . . . entrepreneurs are a special type, and their behavior a special problem.[14]

It is conceptually an almost insurmountable task to attempt the derivation of a functional theory of profit. Certain factors do exist in the aerospace industry which might, possibly, allow one to develop such a theory.

> It cannot be denied that the financial risks of the business are, at least on any single venture, lower in the defense business. In situations where uncertainty is higher, cost-type contracts are used.[15]

However, this would involve a lengthy study with a high probability of a negative outcome.* As desirable as it seems to derive such a functional relationship, profit theory is at present in too rough a state-of-art to accomplish this task. One must be satisfied to realize that a fee above cost, (profit) must be paid to firm to induce them to remain in a given line of endeavor and to keep them competitively viable.

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14 Ibid, P. 83.

15 Arthur D. Little, How Sick Is the Defense Industry? Cambridge, Mass., 1963. P. 70.

* There exists a very high degree of continual innovation in the aerospace industry, which could form the foundation of an entrepreneurial innovation theory. The success of such a theory depends upon whether or not the risk element can be handled by virtue of its inclusion in the contract form. A cursory examination of such a theory reveals that this is only party possible - if risk is held as a parameter and the theory built upon innovation, there may still remain an element of profit unaccounted for, a clear indication that the innovational theory would be an inadequate solution.

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ERRATA

Page 9-10: Table 2 should appear on page 25 replacing the Table 2 found thereon. The Table 2 now appearing on page 25 is an erroneous duplication of Table 2 of Part II, and is properly located on page 83.

Page 21: Line 1 should read:

adj NW(t) = .5 [NW(t) - Pat(t) + Div(t) +NW(t-1)]

Line 5 should read:

The return rates in Table 1 . . .

Line 7 (table number) should read(instead of Table 2)

Table 1

Page 51: Line 17 (topic heading) should read:

Examination of the Measures ρ (t), r(t) and z(t)